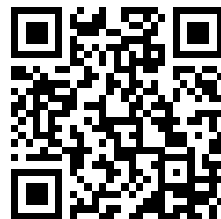

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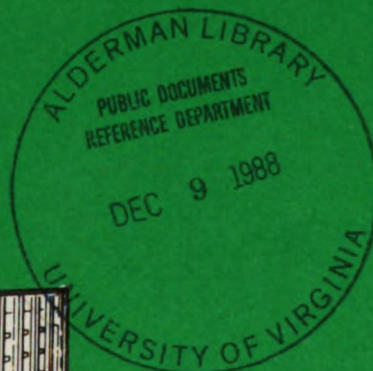


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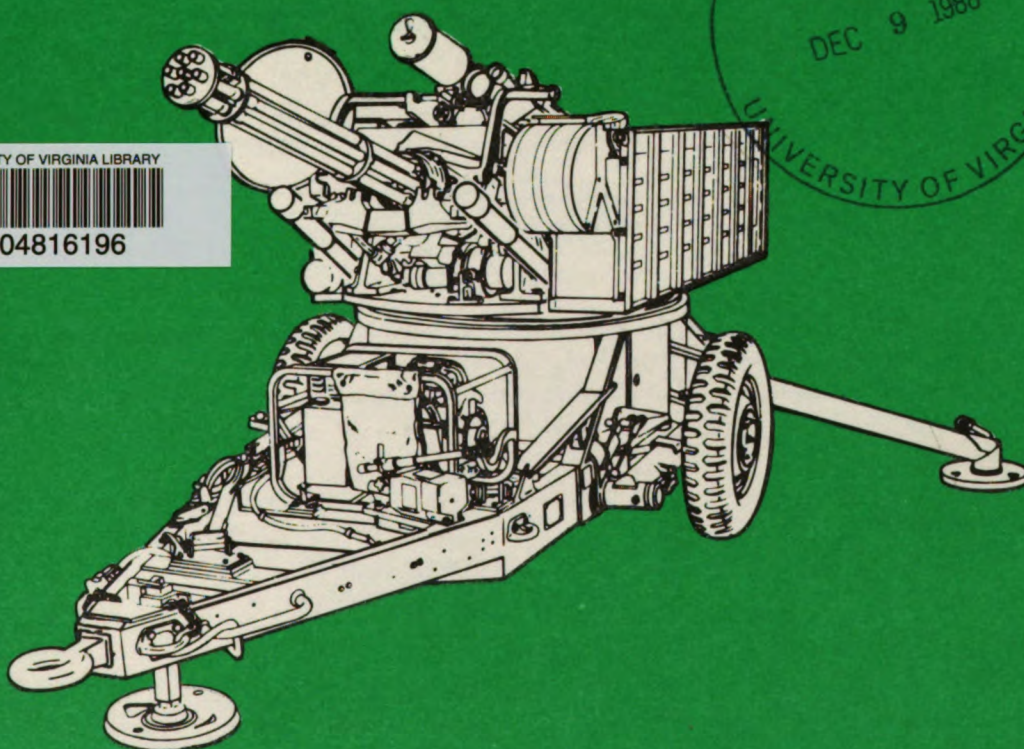
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FOR
GUN, AIR DEFENSE ARTILLERY,
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20-MM, M167A1
(1005-01-014-0837)

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DANGEROUS VOLTAGE

HIGH VOLTAGE is used in this system. Death or injury can result if you do not observe the safety precautions given in the instructions.

LOW VOLTAGE can also be dangerous. **DON'T** be misled by this term. Potentials as low as 50 volts may cause death under certain circumstances.



AN/VPS-2 RADAR SET

HIGH VOLTAGE is present in the receiver-transmitter (unit 2) when the panel assembly is opened for servicing and the power is on. Be careful when changing radar frequency.

A potential **RADIATION** hazard exists when radar is energized and transmitting. Stay at least 3 feet away from center of radar antenna when radar is transmitting.



M168 CANNON

ALWAYS make sure **CANNON IS CLEARED** after firing and before servicing. When a cannon stoppage occurs and there is danger of a **COOKOFF** - take cover and wait for 30 minutes until cannon barrels have cooled before attempting to clear cannon. Always make sure cannon is aimed towards a safe area.

If faulty ammunition is suspected, immediately stop firing and take cover until danger of a **HANGFIRE** has passed. Make sure cannon is aimed towards a safe area.



AMMUNITION

Electrically-primed ammunition can fire if exposed to high-power radio frequency fields. Avoid contact of any kind with the primer, especially metal objects.

Rechambering of live ammunition is prohibited. This can result in a **HANGFIRE** that can cause injury or death of personnel as well as damage to the system.



WHEN REFUELING the APU, make a metal-to-metal contact between fuel tank and filling device to prevent static electricity buildup. Observe all safety rules related to fuel handling.

CHANGE }
No. 5 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 22 May 1986

OPERATOR'S MANUAL (CREW)
GUN, AIR DEFENSE
ARTILLERY, TOWED
20-MM, M167A1
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B-15 and B-16

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General, United States Army
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CHANGE

NO. 4

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**Operator's Manual (Crew)
for
GUN, AIR DEFENSE ARTILLERY,
TOWED
20-MM, M167A1
(1005-01-014-0837)**

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2-73 and 2-74
2-77 and 2-78
2-83 and 2-84
3-1 through 3-22
3-25 through 3-28
3-31 and 3-32
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2-61 through 2-66
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2-73 and 2-74
2-77 and 2-78
2-83 and 2-84
3-1 through 3-22
3-25 through 3-28
3-31 and 3-32
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CHANGE

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Operator's Manual
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For
GUN, AIR DEFENSE ARTILLERY, TOWED
20-MM, M167A1 (1005-01-014-0837)

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2-77 and 2-78
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2-79 through 2-84
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2-75 and 2-76
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2-77 and 2-78
2-78.1 through 2-78.10
2-79 through 2-84
3-1 through 3-46
3-51 through 3-56
3-67 and 3-68
3-73 through 3-78
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**Operator's Manual
(Crew)
For
GUN, AIR DEFENSE ARTILLERY, TOWED
20-MM, M167A1
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2-67 and 2-68
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2-33 through 2-42
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CHANGE

No. 1

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For
GUN, AIR DEFENSE ARTILLERY, TOWED
20-MM, M167A1
(1005-01-014-0837)**

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2-45 through 2-58
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2-59 through 2-68
2-69/2-70 Blank
2-71 through 2-84
2-85/2-86 Blank

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3-1 through 3-8
3-11 through 3-14
3-19 through 3-28
3-33 through 3-40
3-43 through 3-52
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3-55 through 3-60
3-63 through 3-68
3-69/3-70 Blank
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3-83 through 3-88
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3-63 through 3-68
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3-73 through 3-76
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3-89/3-90 Blank
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WARNING

M168 CANNON

Alert everyone in area before moving cannon.

TECHNICAL MANUAL

No. 9-1005-286-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 28 MAY 1976

OPERATOR'S MANUAL
(CREW)
GUN, AIR DEFENSE ARTILLERY, TOWED
20-MM, M167A1 (1005-01-014-0837)

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of the manual and mail the form direct to Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAS, Rock Island, IL 61299-6000. A reply will be furnished directly to you.

		Page
CHAPTER	1. INTRODUCTION	1-1
Section	I. General	1-1
	II. Description and Data	1-1
	Weights and Dimensions	1-1
	Performance	1-2
	Radar Range	1-2
	Tire Pressure	1-2
	Nomenclature Cross Reference	1-3
CHAPTER	2. OPERATING INSTRUCTIONS	2-1
Section	I. M167A1 Controls, Instruments, and Indicators	2-1
	System Components Location	2-2
	Mount	2-4
	Radar Components	2-13
	Carriage	2-17
	External Controls	2-19
	Auxiliary Power Unit (APU)	2-20
	II. Operation Under Normal Conditions	2-21
	Battery Taps	2-21
	Firing Interrupter	2-22
	Linker-Delinker Operation	2-24
	Loading the 500 Round Ammunition Storage Unit	2-25
	Unloading the 500 Round Ammunition Storage Unit	2-26.2
	Sight Current Generator	2-28
	Azimuth Indicator	2-32
	M134 Telescope and M164 Mount	2-33
	Hydraulic System	2-34
	Preparation for Towing and Travel	2-35
	Gun Emplacement	2-38
	Preparation for Firing	2-39
	Precautions When Firing	2-56
	Firing	2-58.1

*This manual supersedes TM 9-1005-286-10-1, 15 June 1973, TM 9-1005-286-10-2, 15 June 1973, and TM 9-1005-286-ESC, 25 March 1977, including all changes.

Section	III. Operating Auxiliary and Support Equipment	2-71
	Communications Equipment	2-72
	Boresight Kit	2-73
	M1A1 Gunner's Quadrant	2-74
	AN/TVS-2B Night Vision Sight	2-75
	AN/TVS-5 Night Vision Sight	2-76
	Auxiliary Power Unit (APU)	2-76.2
	Target Alert Data Display Set (TADDs)	2-78.1
	TADDs Operator Checks and Adjustments	2-78.3
	TADDs Operating Procedures	2-78.8
	IV. Operating Under Unusual Conditions	2-79
	Operating in Extreme Cold (0° to -65°F)	2-79
	Operating in Extreme Heat	2-82
	Operating in Dusty or Sandy Areas	2-83
	Operating Under Rainy or Humid Conditions	2-84
	Operating With One or Two Flat Tires	2-86
CHAPTER	3. MAINTENANCE INSTRUCTIONS	3-1
Section	I. Tools and Equipment	3-2
	II. Forms and Records	3-2
	III. Lubrication	3-2
	IV. Preventive Maintenance Checks and Services (PMCS)	3-3
	General Procedures	3-4
	V. Daily Armament System Check	3-19
	Boresighting, Distant Aiming Point Method	3-30
	Boresighting, Target Method	3-39
	Changing Radar Frequency	3-47
	VI. Round Interval Maintenance	3-55
	VII. Troubleshooting	3-56
	Symptom Index	3-56
	VIII. Corrective Maintenance	3-71
	Distribution Box	3-72
	Declutching Feeder	3-72
	Batteries	3-73
	M168 Cannon	3-75
	Control Assembly	3-84
	M61 Sight and Azimuth Indicator	3-85
	Receiver-Transmitter and RF Lamps	3-86
	Receiver-Transmitter Air Filter	3-87
	Power Supply Air Filter	3-88
	Antenna Reflector and Feed Assembly	3-89

	Page
CHAPTER 4. MAINTENANCE OF AUXILIARY EQUIPMENT	4-1
Auxiliary Power Unit (APU)	4-1
Gunner's Quadrant	4-1
Night Vision Sight	4-1
H-251/U Headset	4-1
TA-312/PT Telephone Set	4-1
Boresight Kit	4-1
Section 5. AMMUNITION	5-1
I. General	5-1
Description and Identification	5-1
II. Preparation for Firing	5-4
III. Care, Handling, and Preservation	5-4
APPENDIX A. PUBLICATION REFERENCES	A-1
B. COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS	B-1
Section I. Introduction	B-1
II. Components of End Item	B-2
III. Basic Issue Items	B-4
APPENDIX C. ADDITIONAL AUTHORIZATION LIST	C-1
Section I. Introduction	C-1
II. Additional Authorization List	C-2
APPENDIX D. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST	D-1
Section I. Introduction	D-1
II. Expendable/Durable Supplies and Materials List	D-1
APPENDIX E. STOWAGE AND SIGN GUIDE	E-1
ALPHABETICAL INDEX	I-1

LIST OF TABLES

	Table	Page
Preventive Maintenance Checks and Services	3-1	3-6
Daily Armament System Check	3-2	3-19
Preventive Maintenance - Round Interval. Deleted ..	3-3	3-55
Troubleshooting	3-4	3-57
Type and Color Codes of Ammunition	5-1	5-1

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope. This manual provides crew operating and maintenance instructions for the M167A1 towed VULCAN system. Use it to maintain your proficiency, and keep your M167A1 in peak condition. A look at the table of contents will show you the scope of the manual.

1-1.1. Reporting of Equipment Improvement Recommendations (EIR). If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on SF 368 (Quality Deficiency Report). Mail it to us at Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-QAD, Rock Island, IL 61299-6000. A reply will be furnished to you.

Section II. DESCRIPTION AND DATA

1-2. Description. The M167A1 towed air defense gun is a lightweight, carriage-mounted weapon. It is towed by the M561 gamma goat or 1-1/2 ton and larger vehicles. It provides close-in defense against low-flying aircraft and ground targets. The major components of the M167A1 are the M168 20MM cannon, the M61 sight, the M42A1 gun carriage, and the AN/VPS-2 radar set. Additional details are shown on pages 1-3 and 1-4. If you want more information on components, ask your organizational maintenance for a copy of TM 9-1005-286-20-1.

WEIGHTS AND DIMENSIONS

Ready for Travel

Weight	1583 kg (3490 lb)
Length	472.4 cm (186 in)
Width	246.7 cm (97.11)
Track	227.1 cm (89.42 in)
Height	205.7 cm (81.00 in)
Maximum Towing Speed	72.42 kph (45 mph)
Fording Depth (APU removed)	93.98 cm (37 in)
Fording Depth (APU installed)	43.2 cm (17 in)
Emplaced with Cannon In Travel Lock	

Length	386.1 cm (152 in)
Width	370.8 cm (146 in)
Height	182.9 cm (72 in)
Clearance (Traversing)	444.5 cm (175 in)
Height (Cannon Full Elevation)	292.1 cm (115 in)
Terrain Level	10° max slope

PERFORMANCE

Firing Rate - Rounds per Minute

High Rate	3000
Low Rate	1000
Burst limits - high rate only	10, 30, 60 or 100 rds

RADAR RANGE

Minimum	250 meters
Maximum	5000 meters (1 sq meter target)

TIRE DESCRIPTION

Size 7.00 x 16LW 6 Ply with cross country tread styles

TIRE PRESSURE

TERRAIN	TIRE PRESSURE	MAXIMUM SPEED
Hard (paved, packed sand, hard clay)	310 kPa (45 PSI)	72 Kmh (45 MPH)
Medium (spadable clay, sod)	207 kPa (30 PSI)	48 Kmh (30 MPH)
Soft (loose sand, mud)	103 kPa (15 PSI)	8 Kmh (5 MPH)

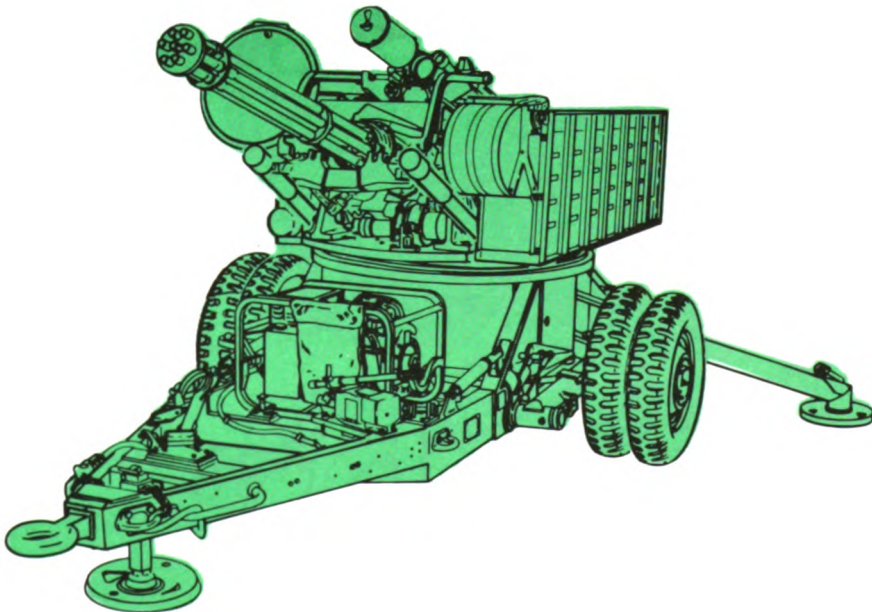
M167A1 GUN SYSTEM

Nomenclature Cross Reference

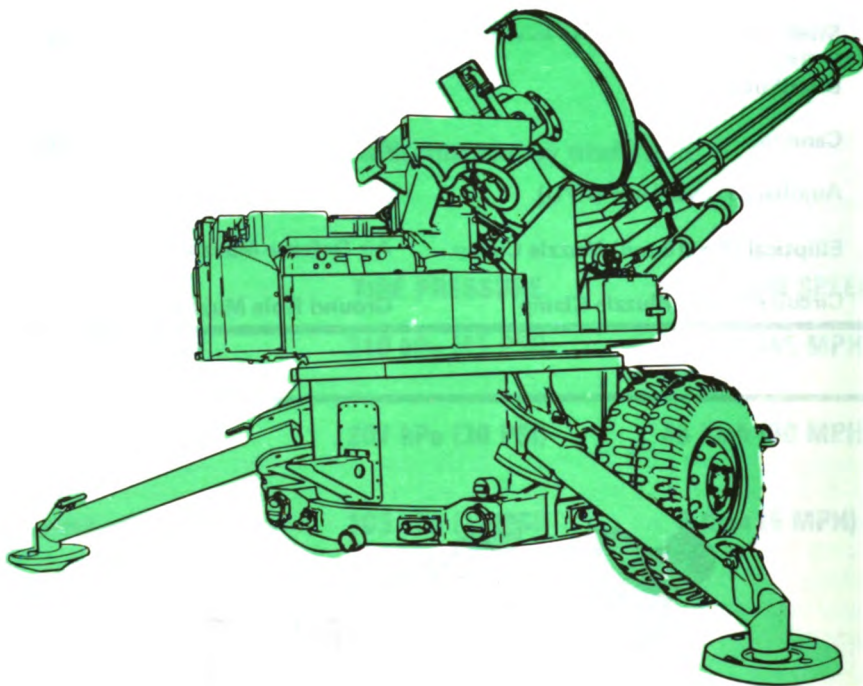
Common Name

Official Nomenclature

Stow Control	Radar Distribution Box (unit 6)
Distribution Box	System Distribution Box
Cannon	Air Defense Gun Cannon (M168)
Auxiliary Power Unit (APU)	Generator Set, Gasoline Engine
Elliptical (6 x 18 mil) Muzzle Clamp	Air Defense Muzzle Clamp
Circular (5 mil) Muzzle Clamp	Ground Role Muzzle Clamp



**M167A1 TOWED 20 MM AIR DEFENSE GUN
(FRONT VIEW, EMPLACED)**



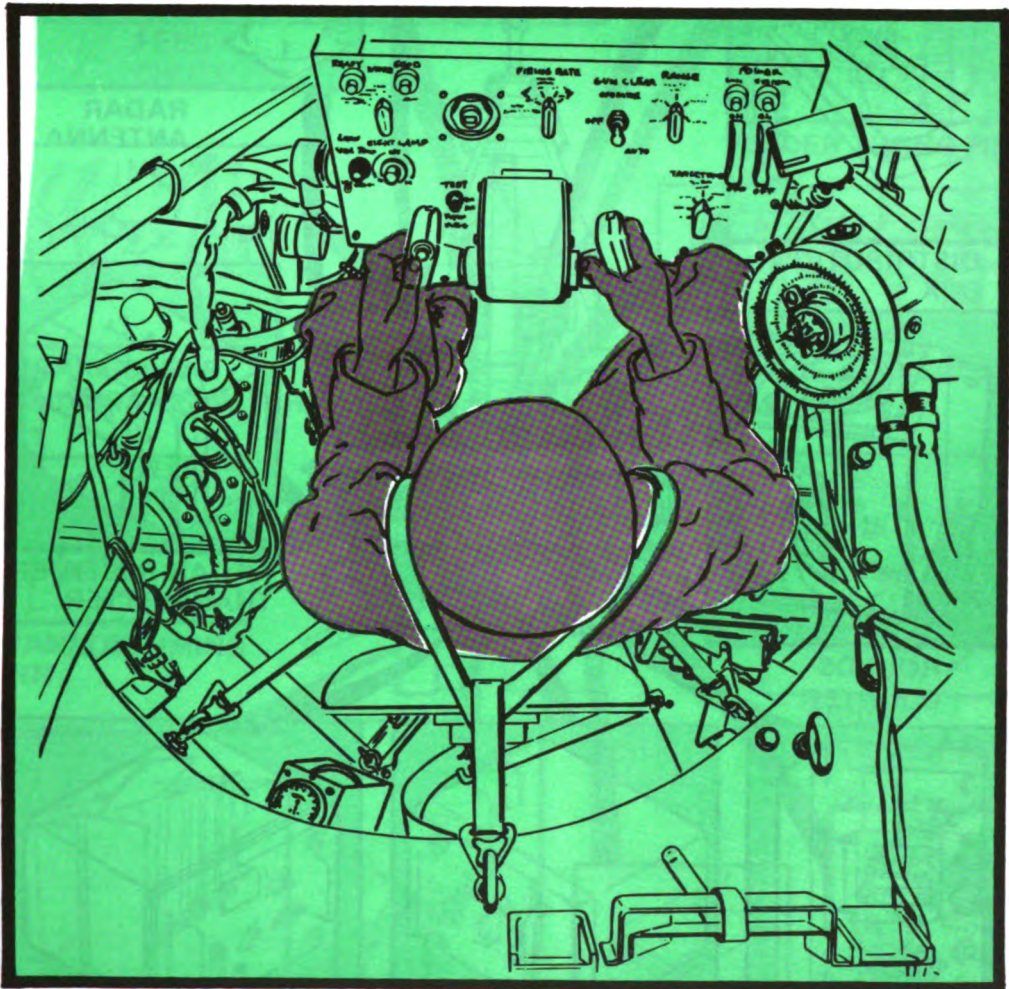
CHAPTER 2

OPERATING INSTRUCTIONS

Section I.

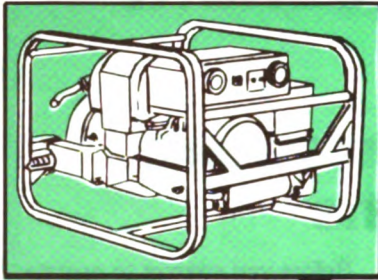
M167A1 CONTROLS, INDICATORS, AND INSTRUMENTS

2-1. KNOW YOUR CONTROLS AND INSTRUMENTS. Before you attempt to operate your equipment make certain that you are familiar with the location and operation of all controls and instruments.

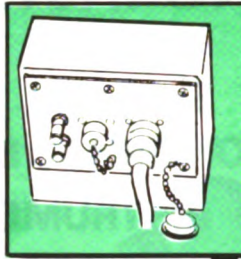


GUNNER'S CONTROLS, INSTRUMENTS, AND INDICATORS

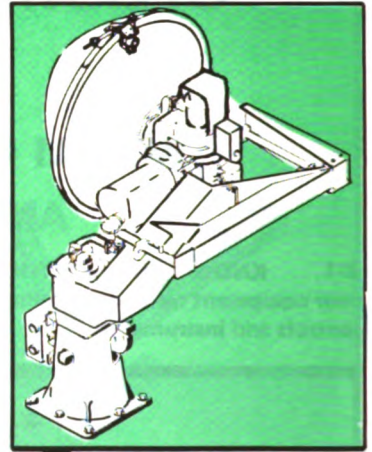
SYSTEM COMPONENTS LOCATION



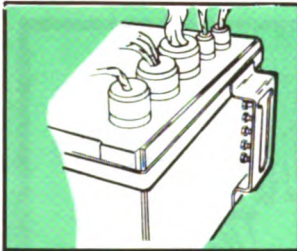
AUXILIARY
POWER UNIT



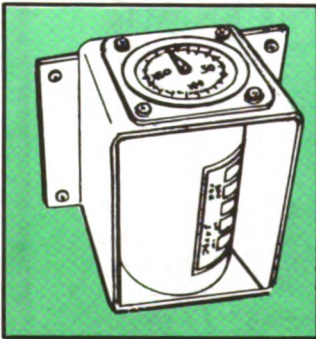
SERVICE
PANEL ON
CARRIAGE



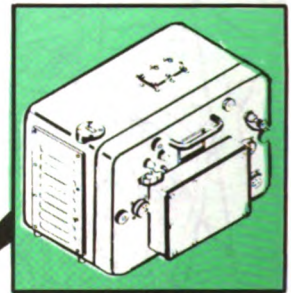
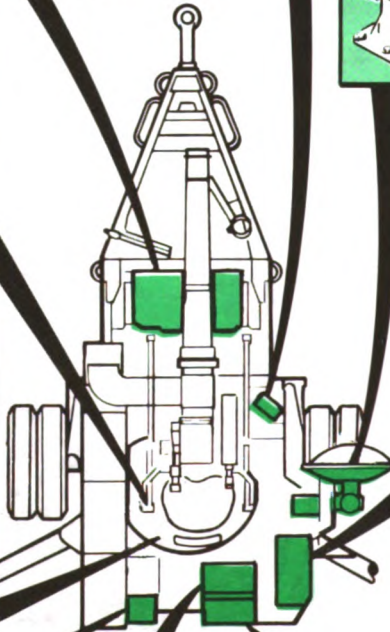
RADAR
ANTENNA



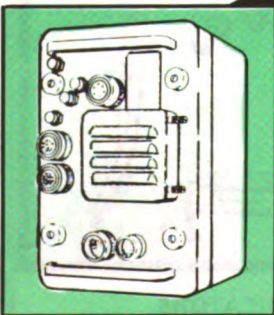
DISTRIBUTION
BOX



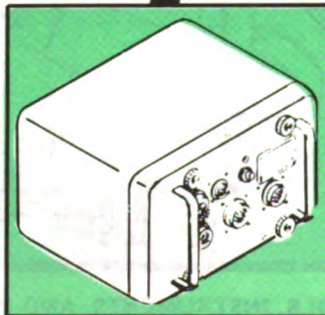
ROUNDS
COUNTER



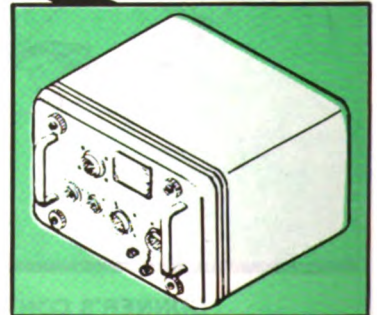
RADAR RECEIVER
TRANSMITTER



RADAR POWER
SUPPLY

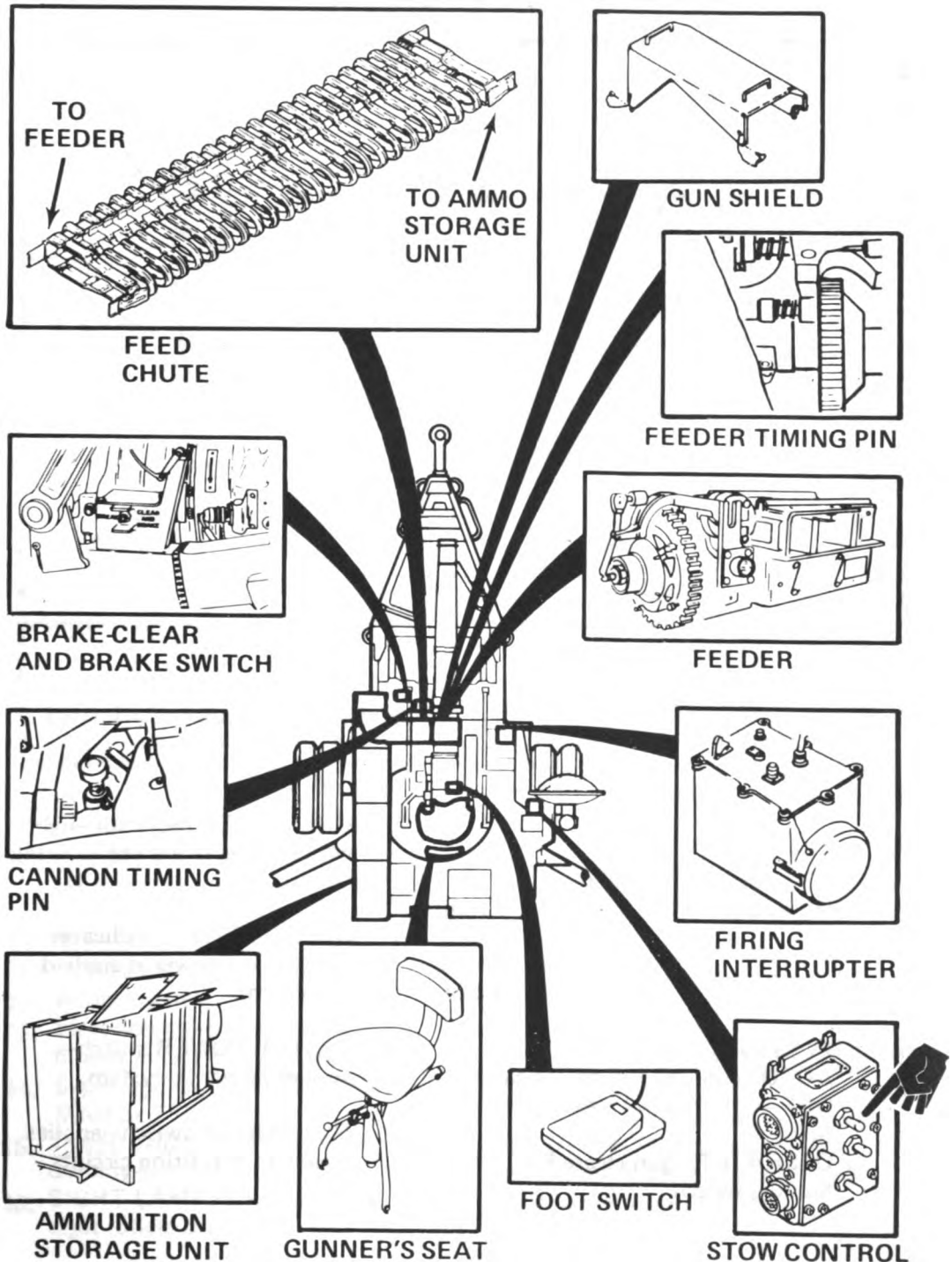


RADAR RANGE
COMPUTER



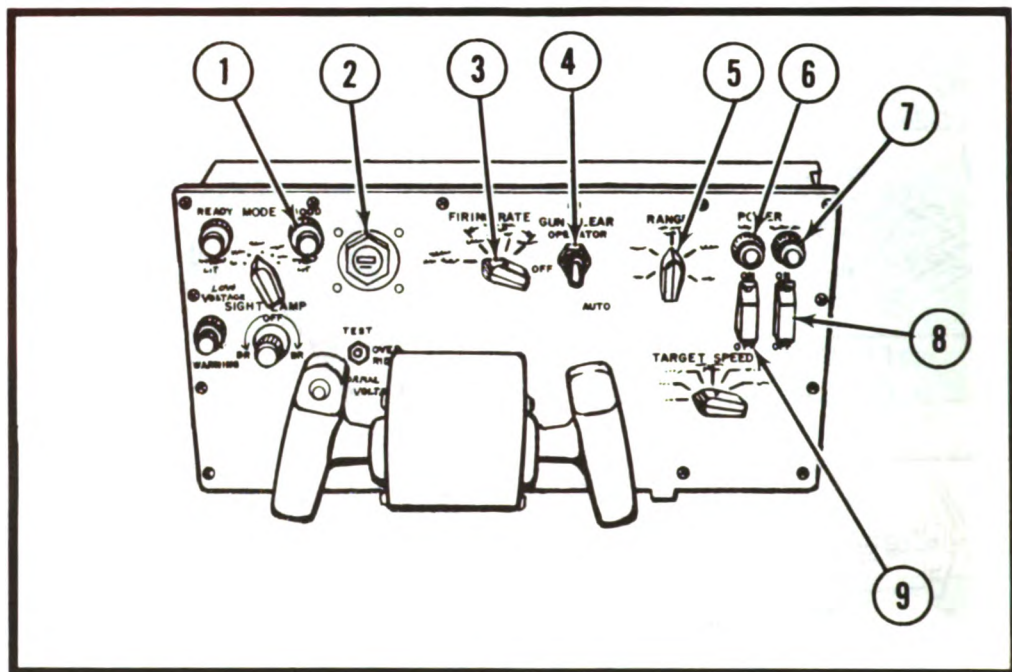
RADAR RECEIVER

SYSTEM COMPONENTS LOCATION - CONTINUED



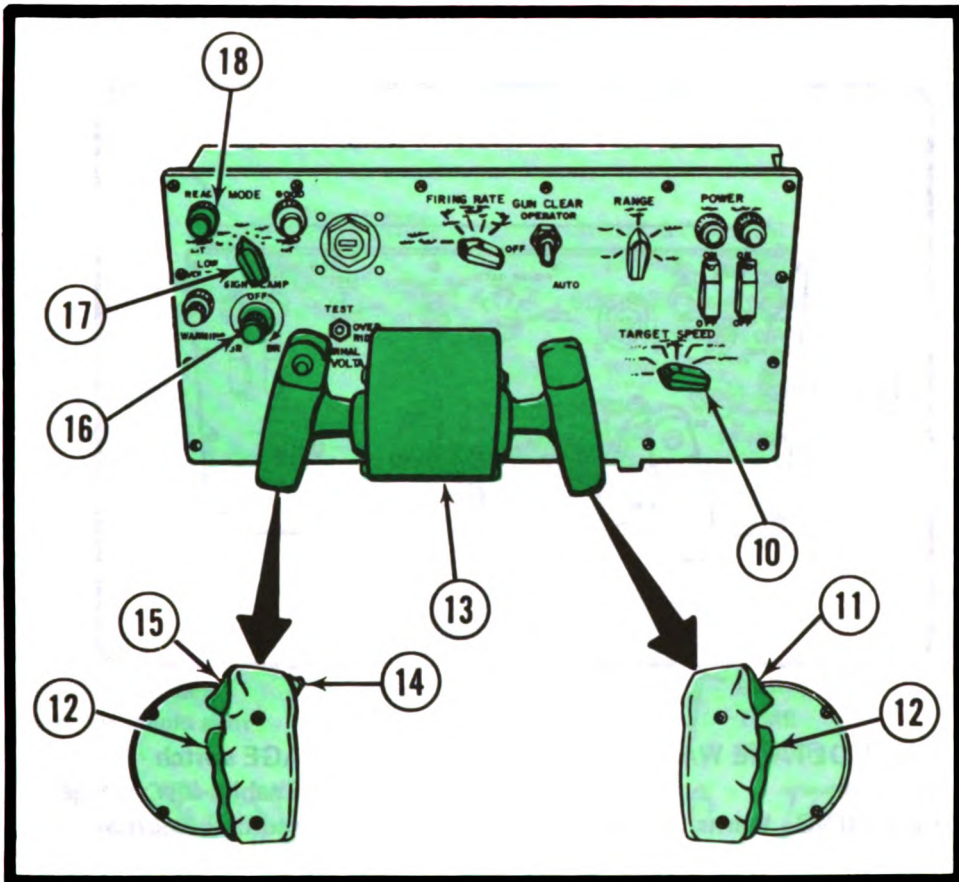
MOUNT

CONTROL ASSEMBLY



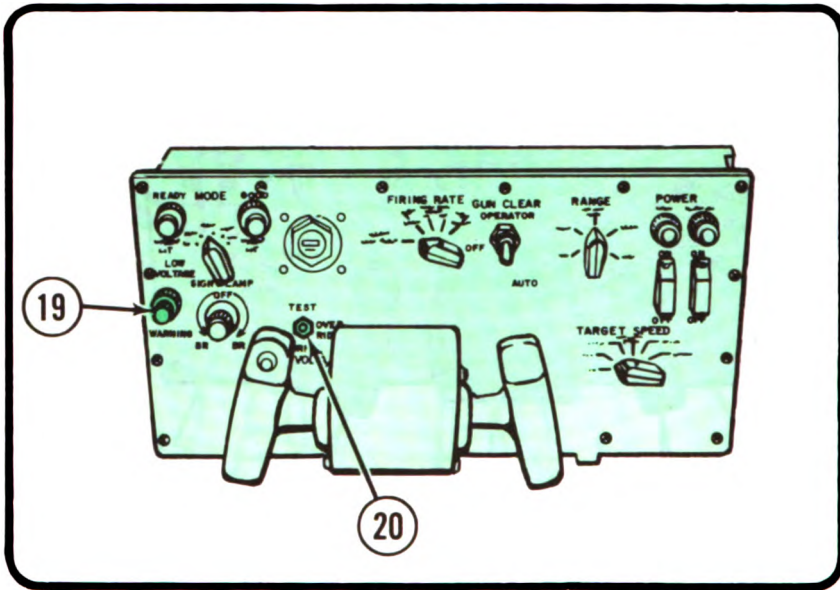
1. GOOD WHEN LIT indicator—
Prefire check test indicator.
2. Elapsed time meter
3. FIRING RATE switch—
LO-NO BURST LIMIT
HI-BURST LIMIT — 10 rounds
— 30 rounds
— 60 rounds
— 100 rounds
4. GUN CLEAR switch—
AUTO—gun clears automatically
OFF—gun does not clear after
firing
OPERATOR—gun cleared by
holding switch
5. RANGE knob—Set estimated
range in MAN. mode.
6. GUN POWER indicator—lights
when power is applied to firing
circuits.
7. SYSTEM POWER indicator—
lights when power is applied
to system.
8. SYSTEM POWER switch—
applies power to system.
9. GUN POWER switch—applies
power to gun firing circuits.

MOUNT – CONTINUED **CONTROL ASSEMBLY**



13. **TARGET SPEED knob**—set estimated speed in MAN mode.
11. **Trigger switch (right handle)**—fires cannon.
12. **Action switch**.
13. **Elevation control**—controls mount in azimuth and elevation.
14. **Sight cage switch**—cages sight in MAN or TEST.
15. **Trigger switch (left handle)**—dummy—no function.
16. **SIGHT LAMP knob**—controls sight reticle brightness.
17. **MODE switch**—
GRD—lead computing feature of sight is not used.
RADAR—target range and speed set automatically.
MAN —target range and speed set by operator.
EXT—range is set by external range control.
TEST—used in prefire checks.
18. **READY WHEN LIT indicator**—lights when radar is ready (after 2 minutes warmup).

VOLUNT — CONTINUED CONTROL ASSEMBLY



LOW VOLTAGE WARNING
indicator -

FLASHING - Warns that system voltage has dropped below 22.0 volts.

STEADY LIGHT - System voltage has dropped below 20.5 volts and has automatically been interrupted. Inverter, sight gyro, radar, and SCG are shut down.

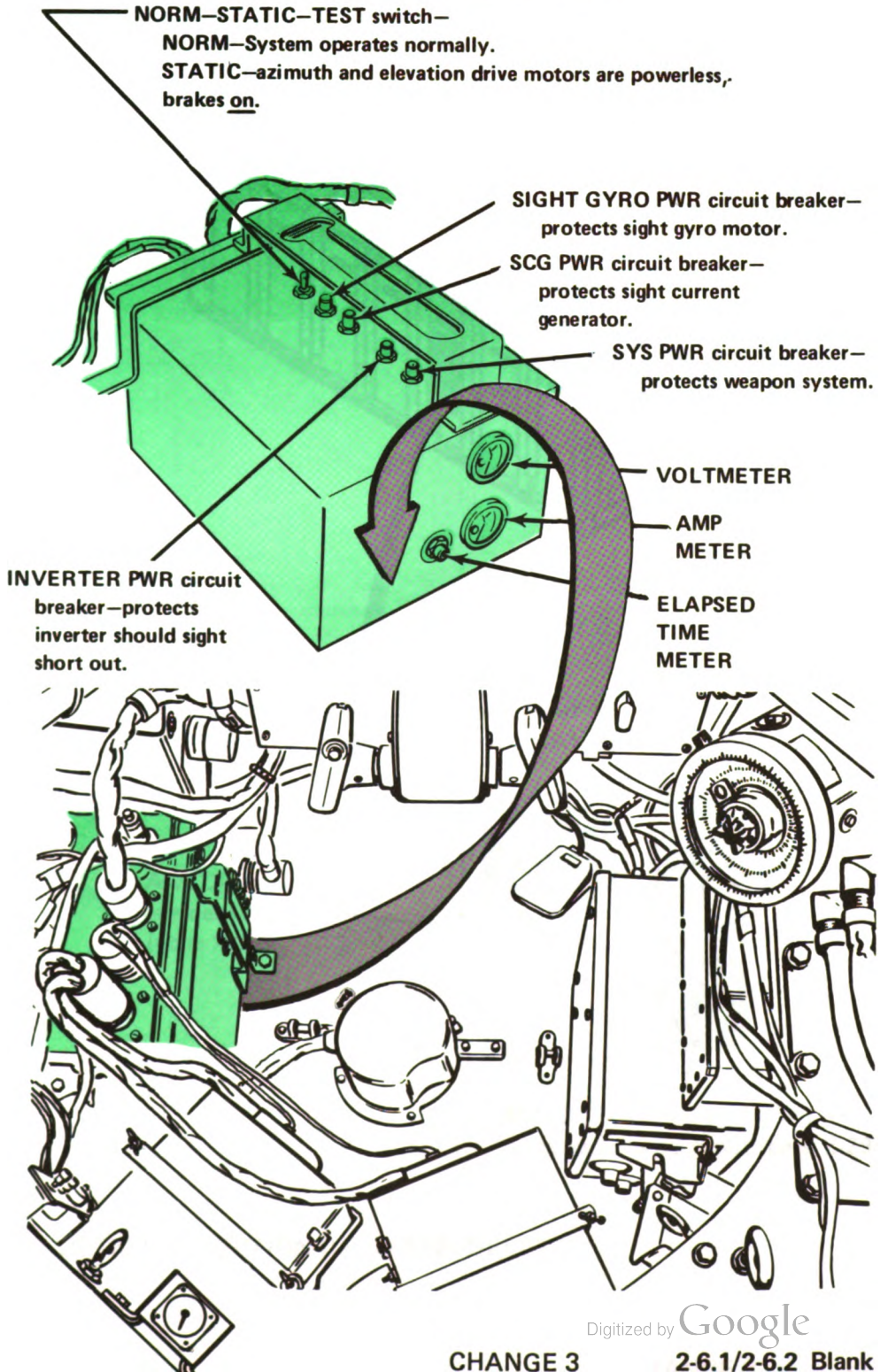
LOW VOLTAGE switch -

NORMAL - Enables low voltage protective circuits to warn of approaching low voltage condition and shut system down if this condition occurs.

OVERRIDE - Overrides low voltage protection circuit. Allows continued operation or restoration of power in ground mode under low voltage conditions.

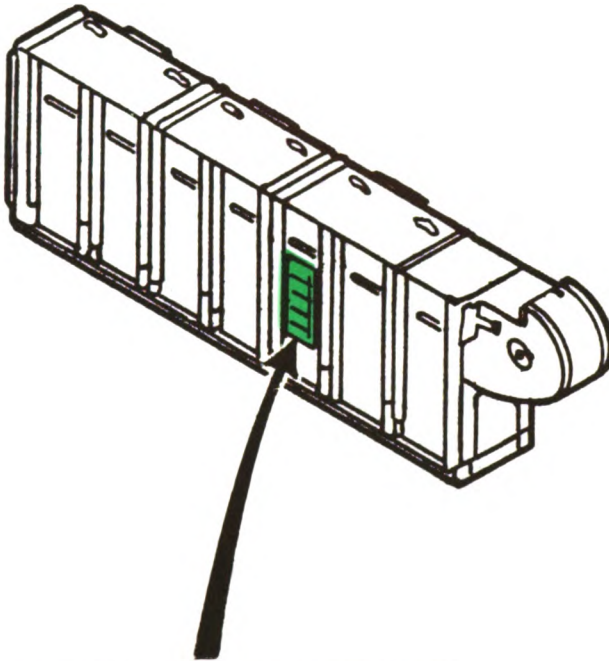
TEST - Tests low voltage protective circuits.

MOUNT – CONTINUED **SYSTEM DISTRIBUTION BOX**

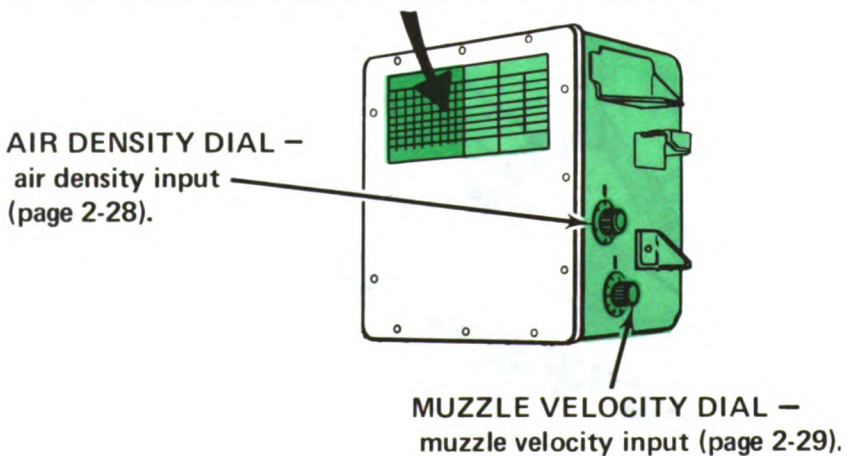


MOUNT – CONTINUED

500 ROUND AMMUNITION STORAGE UNIT



MUZZLE VELOCITY (for M246 ammo only) and
AIR DENSITY (for M246 and M220 ammo) DIAL SETTING chart.



BALLISTIC CORRECTION CARD A12–DELETED

MOUNT — CONTINUED

FIRING INTERRUPTER AND ROUNDS COUNTER

FIRING INTERRUPTER SWITCH

ON — Interruption as selected.

OFF — Bypasses interruption.

NO FIRE WHEN LIT —
Indicates no fire zones.

ARMING
CONNECTOR

LANYARD

CLIP

COVER

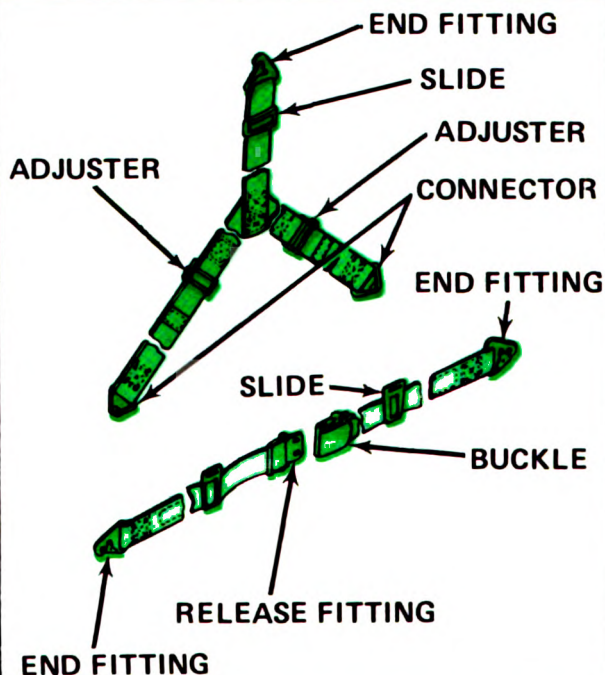
SLIDE RODS — To set
no fire zones.

CLIP



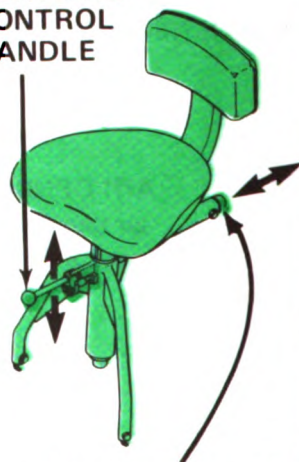
Indicates total rounds fired
(cannot be reset by crew).

SHOULDER HARNESS AND SEAT BELT



GUNNER'S SEAT

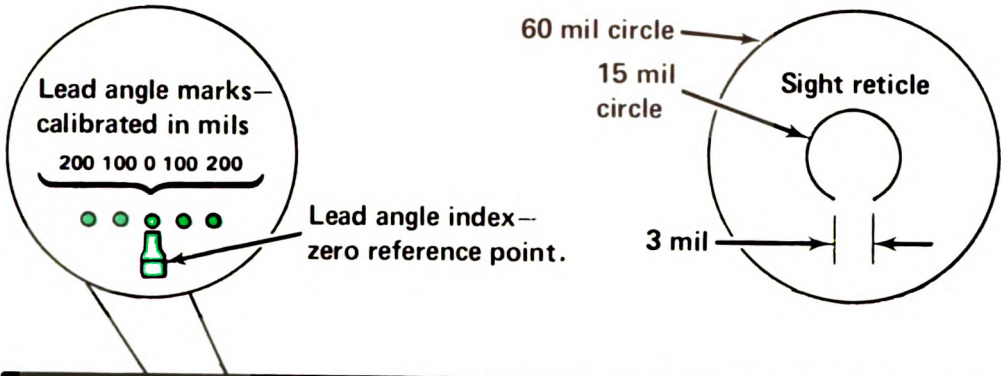
VERTICAL
CONTROL
HANDLE



QUICK RELEASE
LOCK—Depress pin
and slide locking
ring back to
release seat.

MOUNT – CONTINUED

M61 SIGHT



ELEVATION ADJUSTMENT (under cap) —
elevation alignment when boresighting.

AZIMUTH ADJUSTMENT (under cap) —
azimuth alignment when boresighting.

SUN FILTER

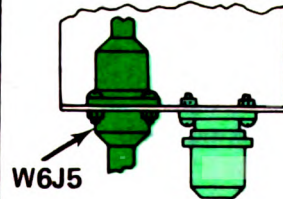
**RETICLE
LAMP
COVER**

CAGED knob —
mechanically cages
and uncages gyro and
provides interlock between
sight and system power.

READY-TO-FIRE INDICATOR —
lights when conditions are correct
to fire in radar and external modes.

CAUTION

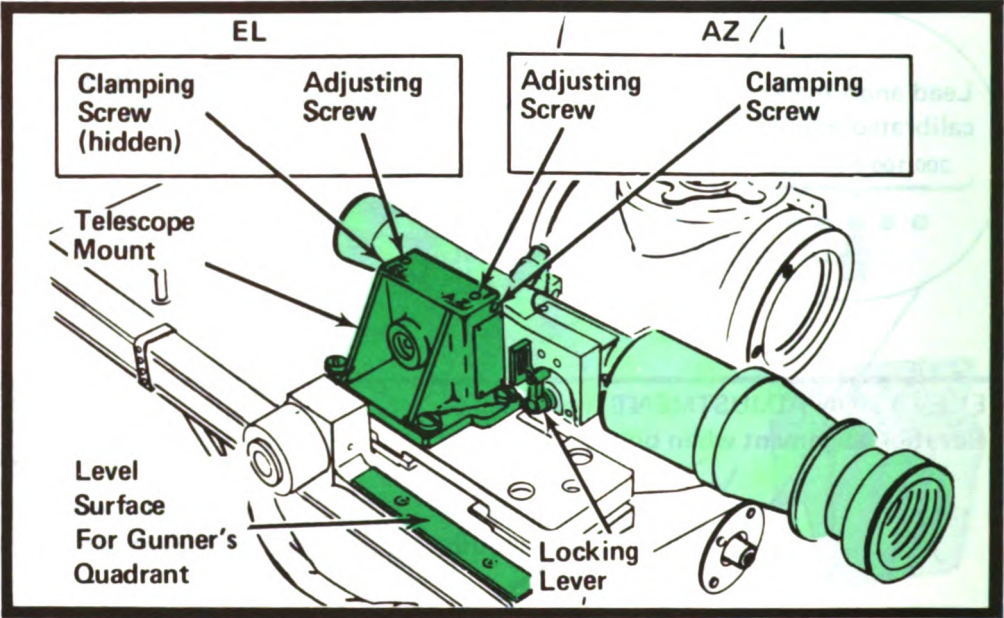
**ALWAYS CAGE SIGHT WHEN NOT IN
USE AND BEFORE TURNING SYSTEM
POWER ON OR OFF**



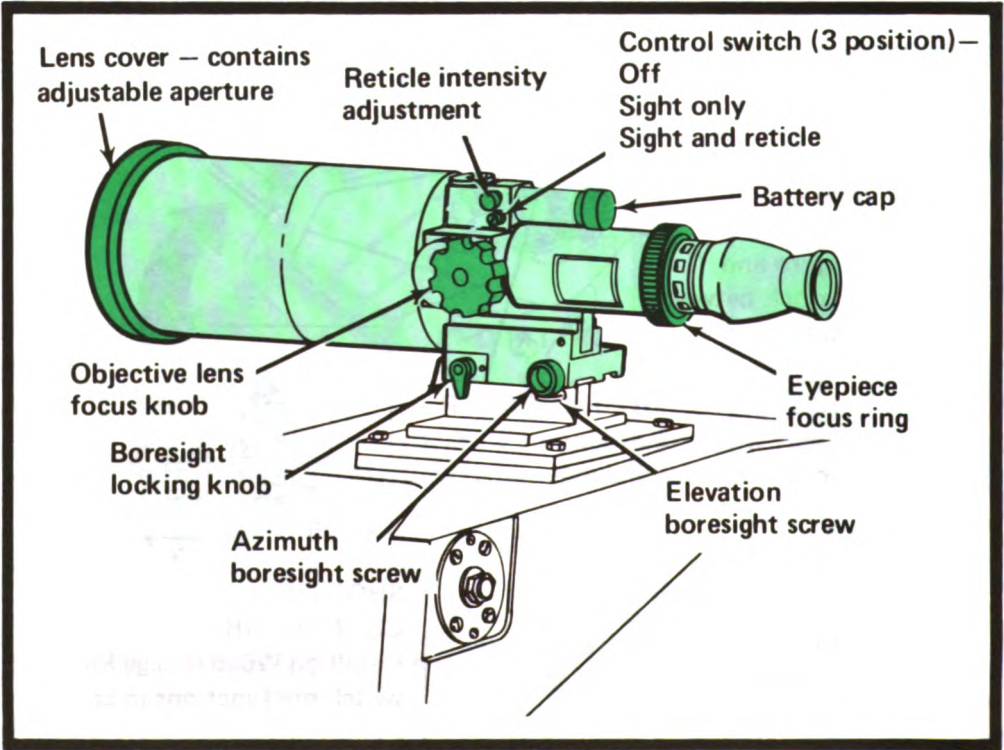
**SHORTING
CONNECTOR**
Install on W6J5 if cage knob
switch malfunctions in critical
situation.

MOUNT – CONTINUED

M134 TELESCOPE AND M164 MOUNT

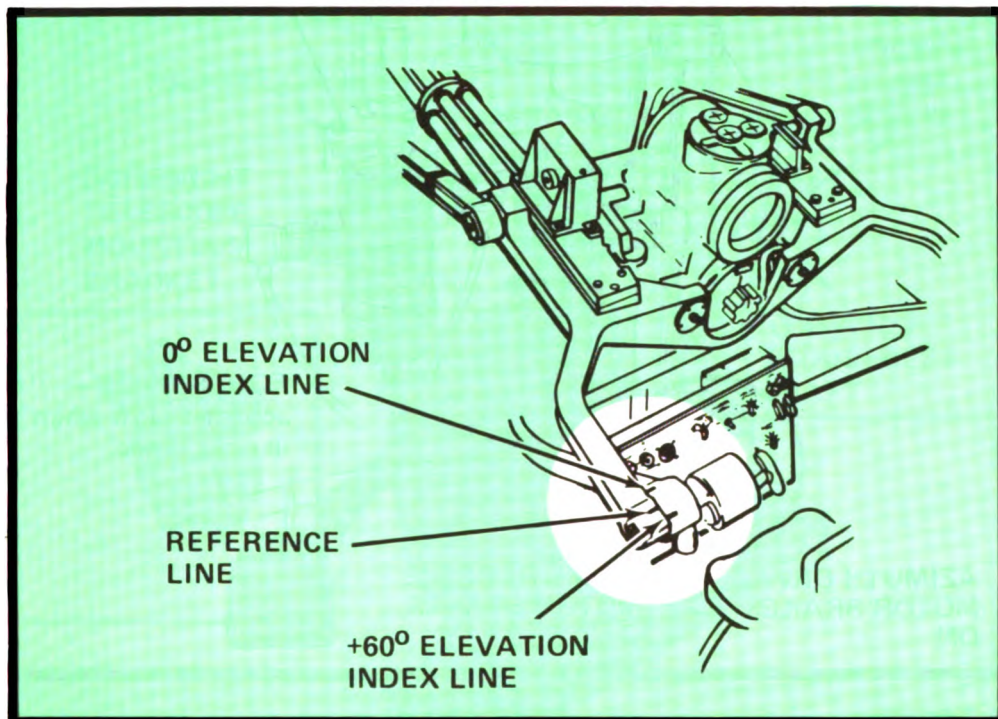


AN/TVS-2B NIGHT VISION SIGHT

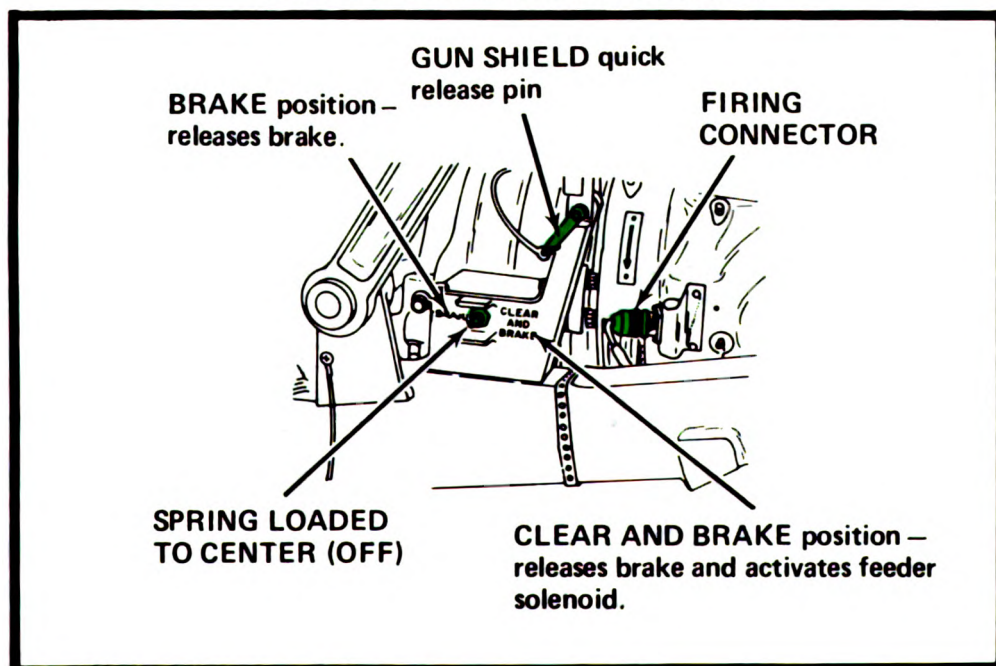


MOUNT — CONTINUED

MOUNT INDEX MARKS

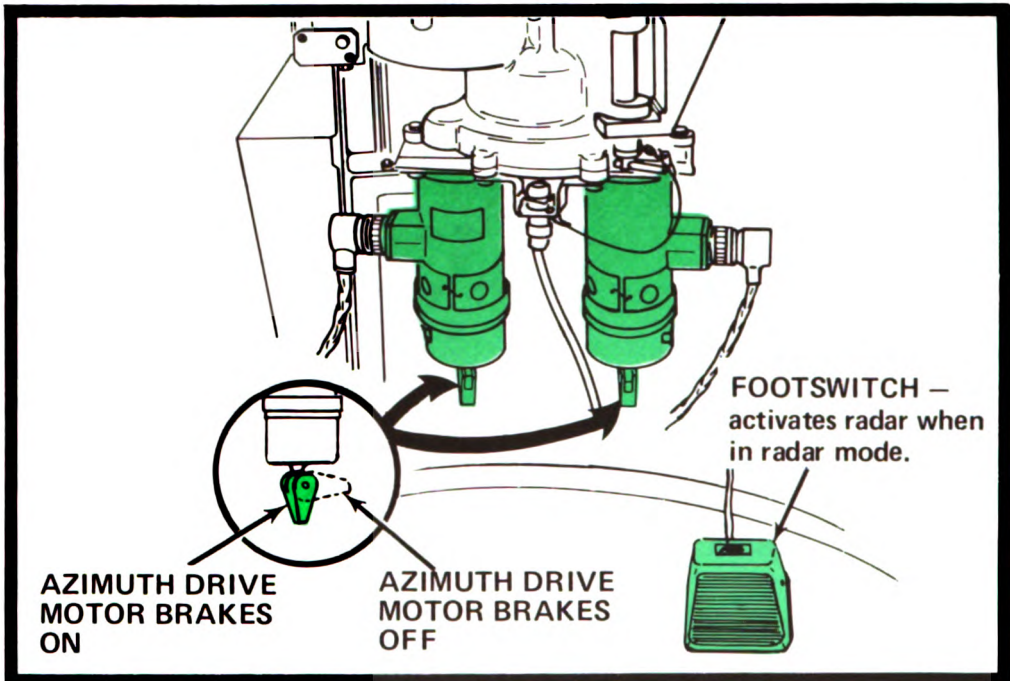


BRAKE-CLEAR AND BRAKE SWITCH

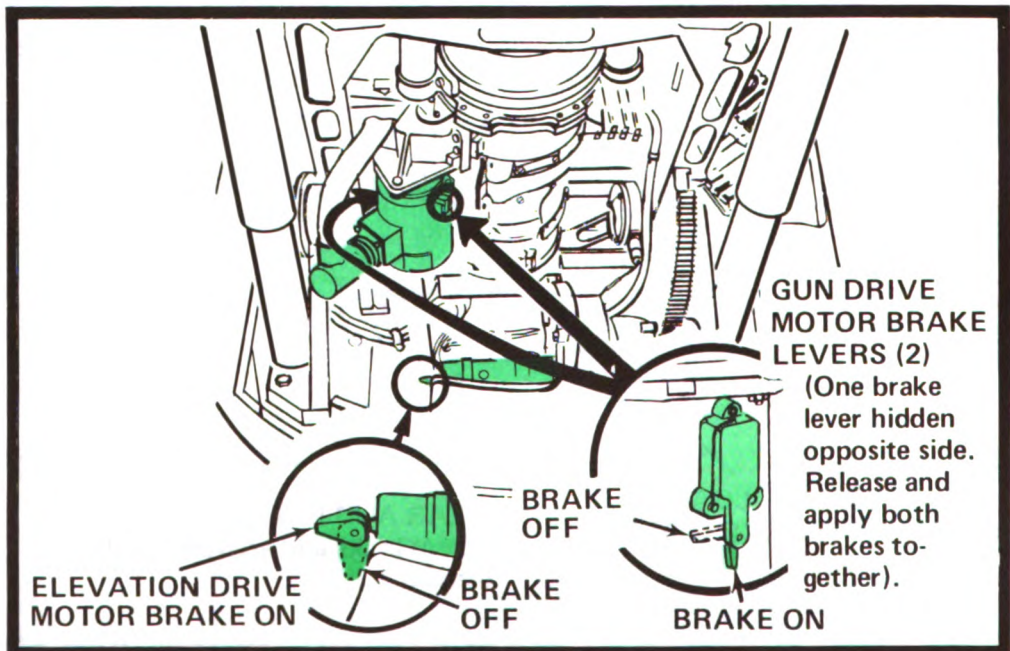


MOUNT—CONTINUED

AZIMUTH DRIVE MOTOR BRAKE LEVERS AND FOOT SWITCH

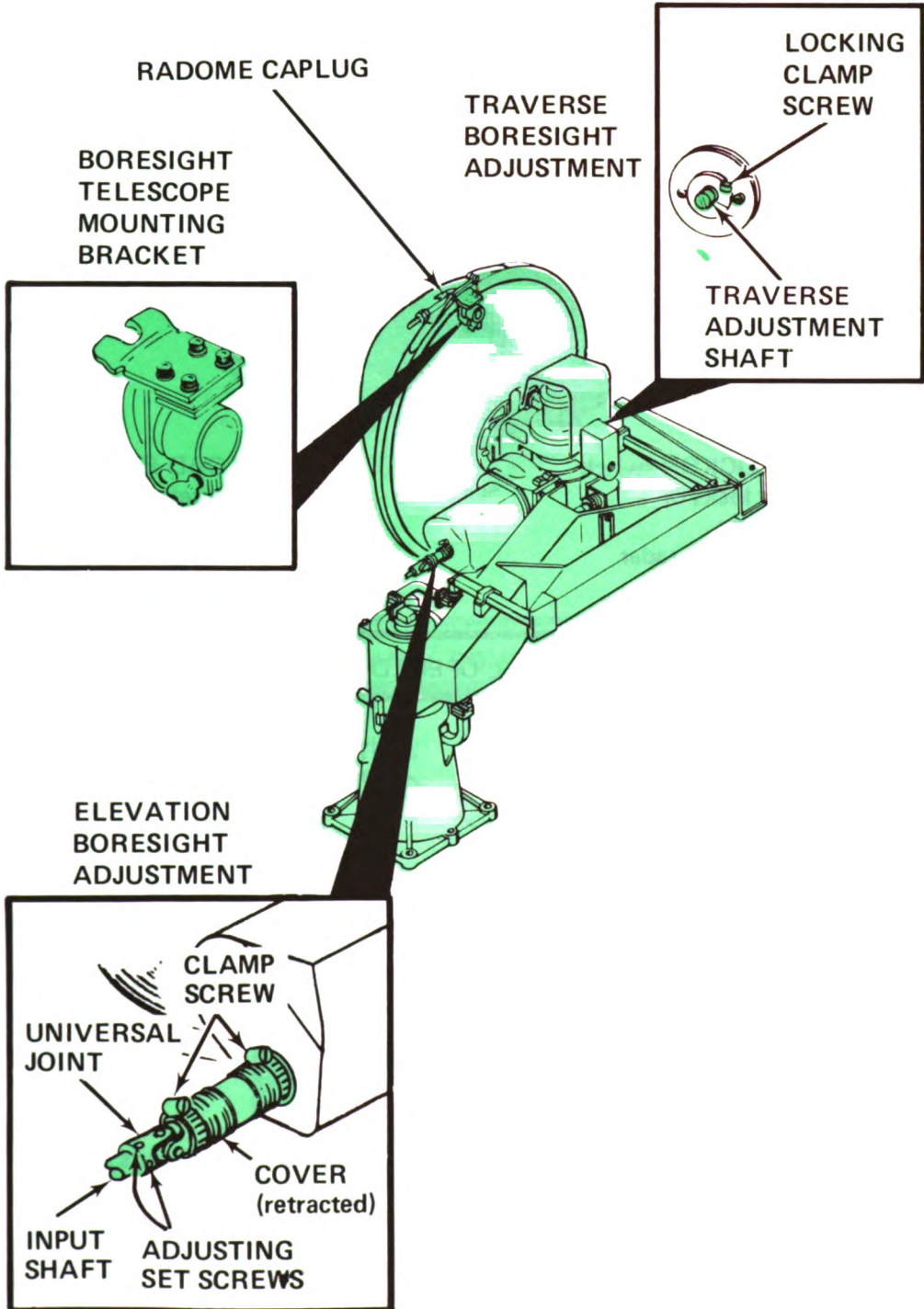


ELEVATION & GUN DRIVE MOTOR BRAKES



RADAR COMPONENTS

RADAR ANTENNA (UNIT 1)

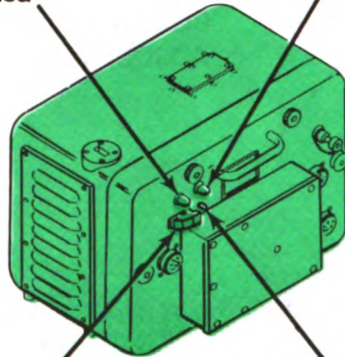


RADAR COMPONENTS – CONTINUED

RADAR RECEIVER-TRANSMITTER (UNIT 2)

HIGH VOLTAGE POWER SUPPLY OVERLOAD
indicator - high voltage power supply overloaded when lit .

MODULATOR OVERLOAD
indicator - modulator overloaded when lit .



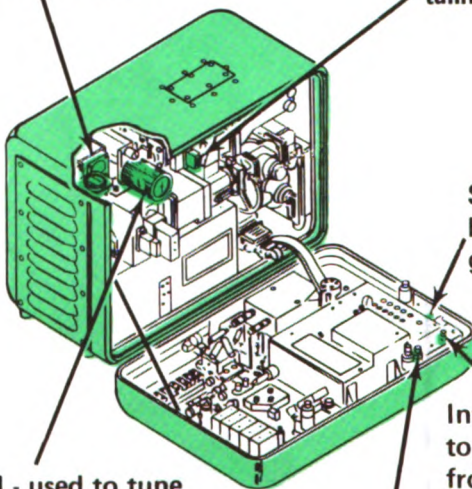
CLUTTER LOCKON switch-TEST - radar locks on a stationary target.
NORMAL - normal radar operation.

OVERLOAD RESET
switch - resets overload sensing circuits (spring loaded to center).

PANEL OPENED

DC MICROAMPERES RF
power meter - RF power level .

Klystron power amplifier cavity
tuning adjustments, (hidden).



SERV RAD CONT switch - bypasses footswitch, energizing radar to radiate .

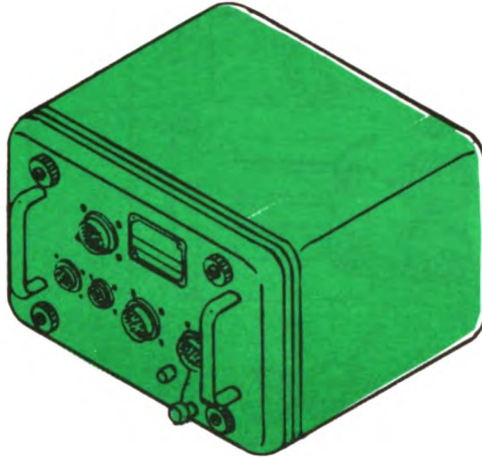
Tuning tool - used to tune klystron cavities .

Interlock switch - cuts power to receiver - transmitter when front panel is opened .

Power indicator - power applied to receiver-transmitter when lit .

RADAR COMPONENTS – CONTINUED

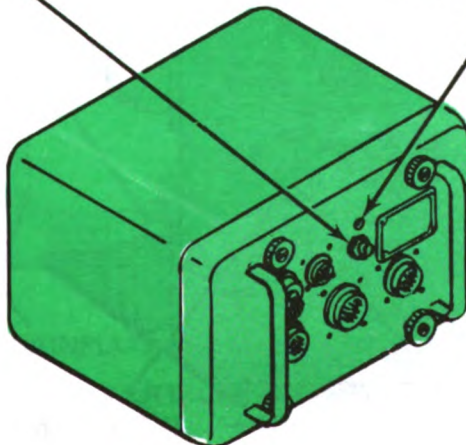
RADAR RECEIVER (UNIT 3)



RADAR RANGE COMPUTER (UNIT 4)

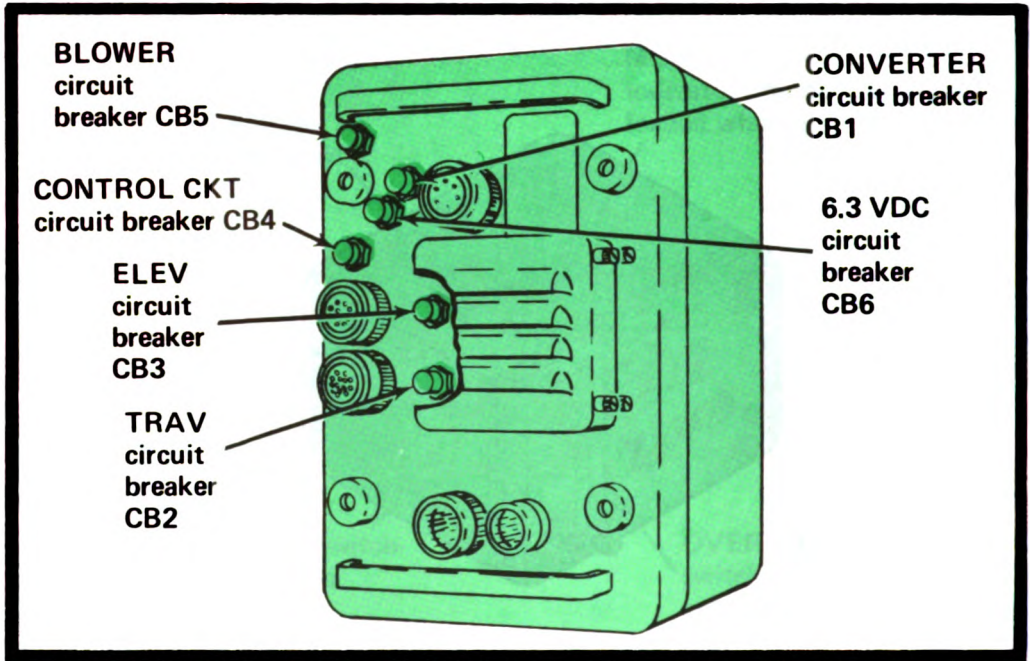
**MID RANGE CALIBRATION
PRESS TO TEST pushbutton
switch**

**Indicator normally flashes
once per second; during
test condition, stays lit if
test is good**

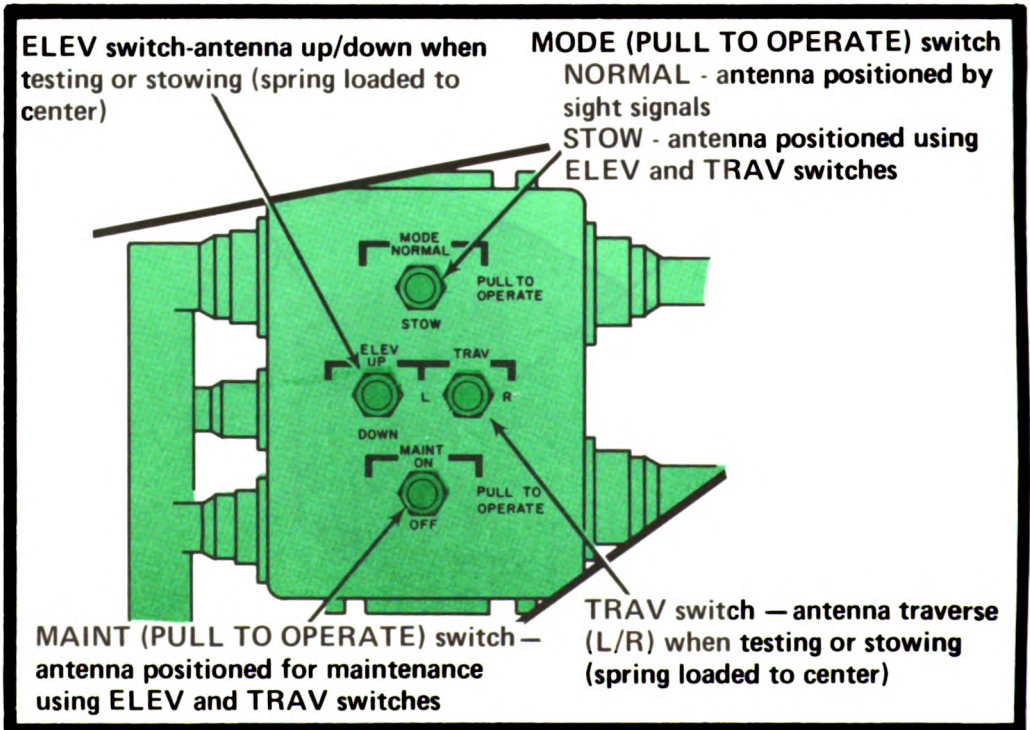


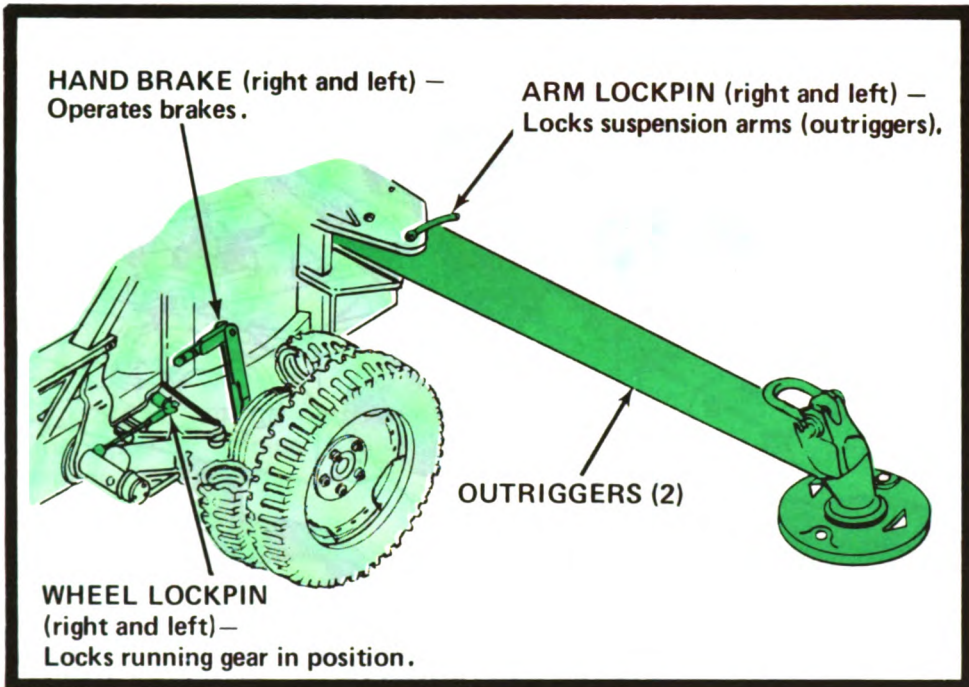
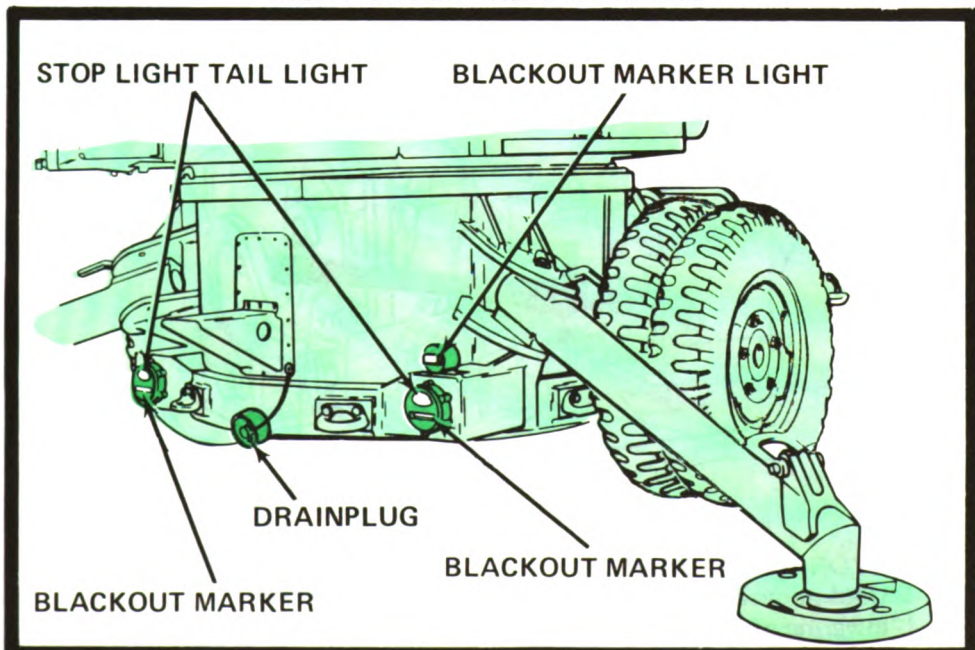
RADAR COMPONENTS — CONTINUED

RADAR POWER SUPPLY (UNIT 5)



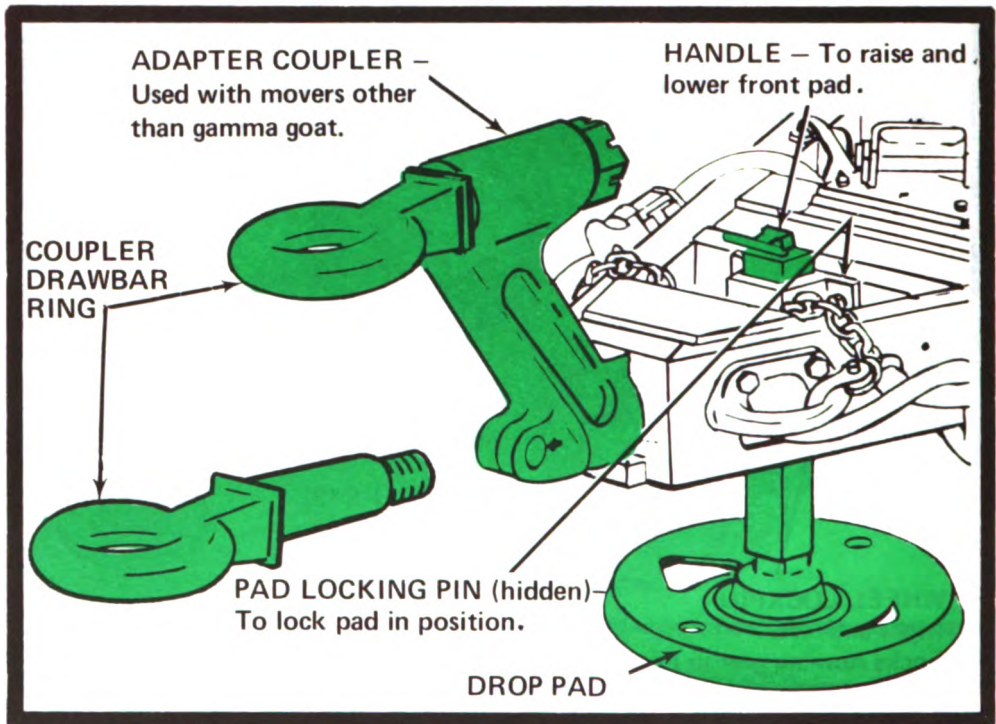
DISTRIBUTION BOX (STOW CONTROL) UNIT 6



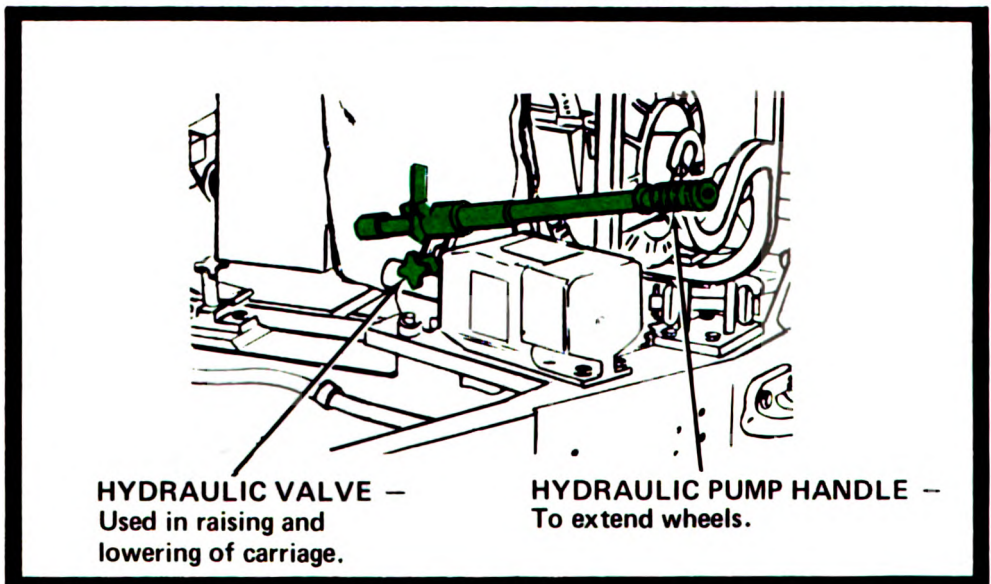
CARRIAGE**LOWER CARRIAGE CONTROLS****LIGHT GROUP AND DRAINPLUG**

CARRIAGE — CONTINUED

FRONT DROP PAD AND COUPLER RING

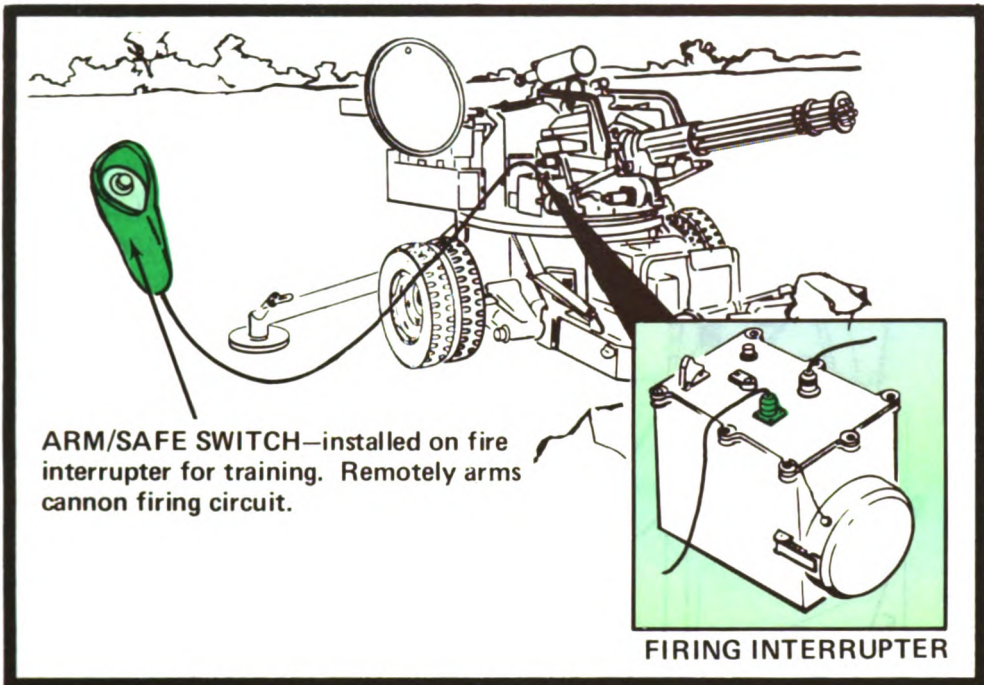


HYDRAULIC SYSTEM CONTROLS

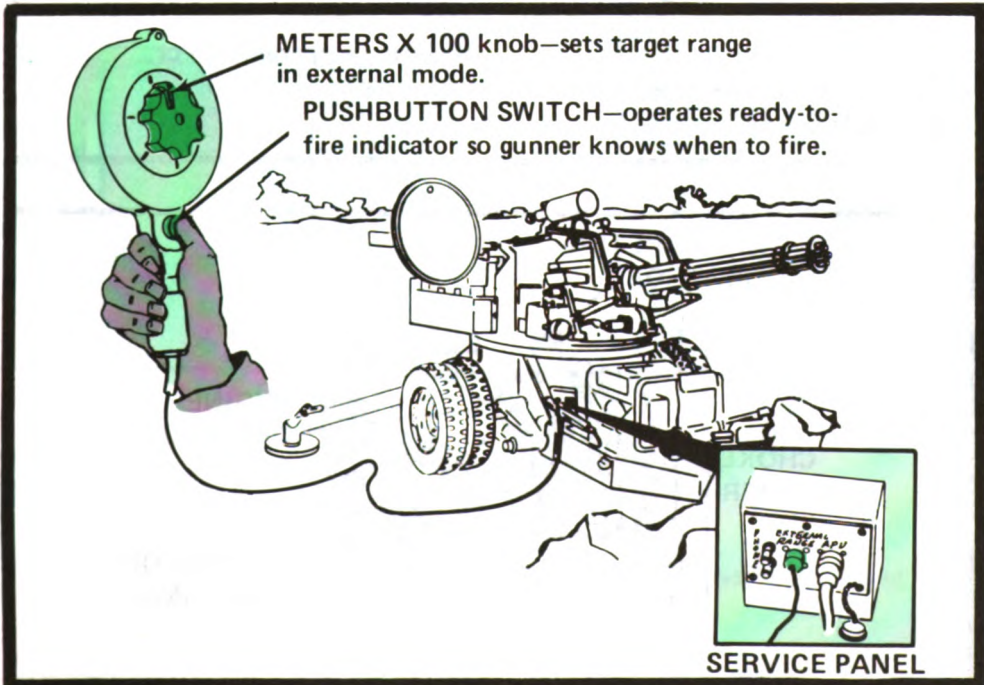


EXTERNAL CONTROLS

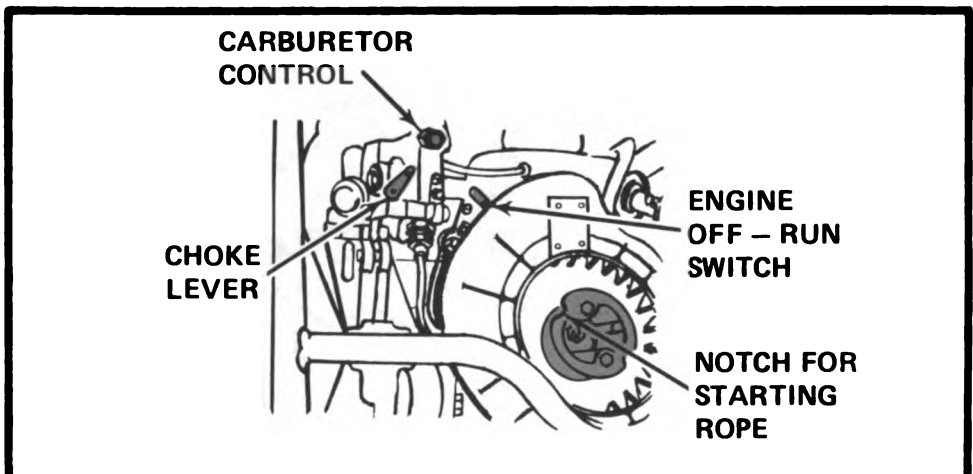
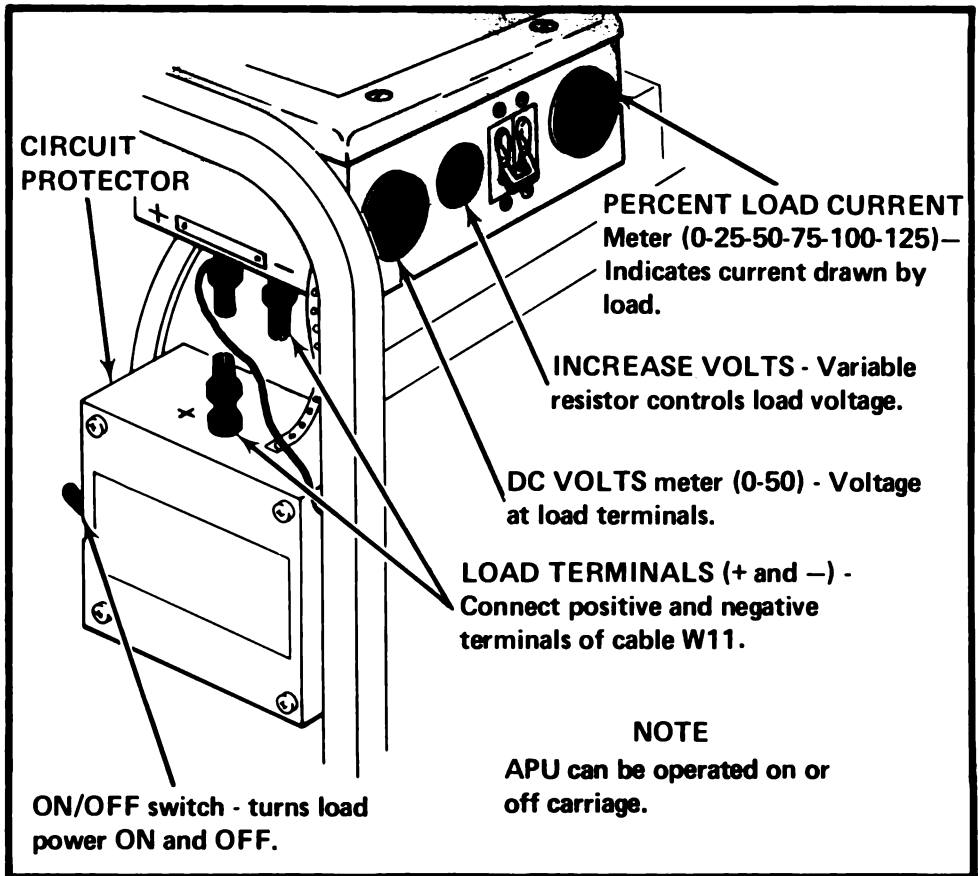
ARM/SAFE SWITCH AND LEAD



EXTERNAL RANGE CONTROL



AUXILIARY POWER UNIT (APU)



Section II.

OPERATION UNDER NORMAL CONDITIONS

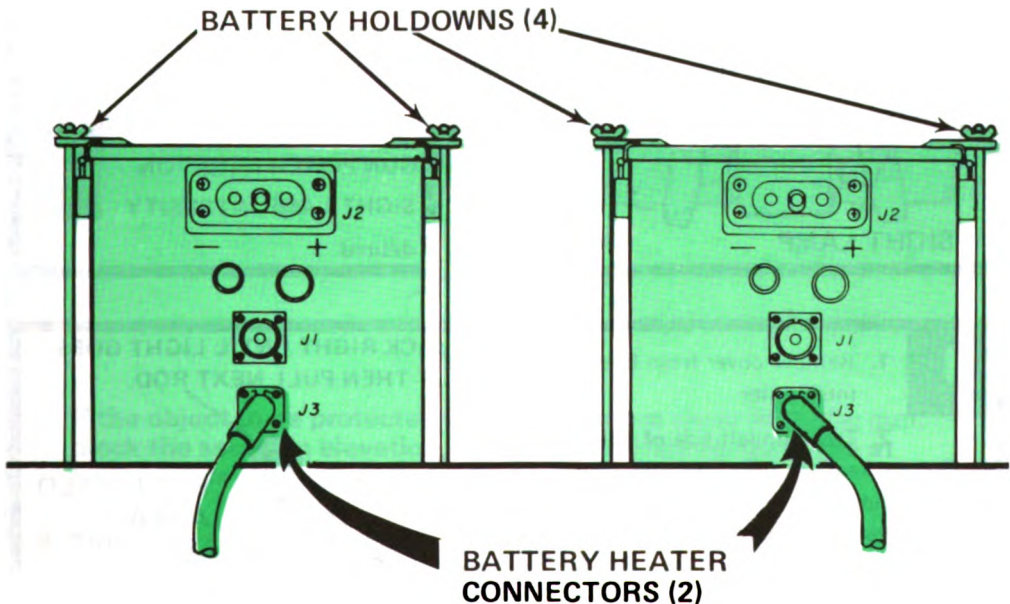
2-2. This section covers operation of the system under normal conditions. Operation under unusual conditions is described in section IV of this chapter.

2-3. Refer to chapter 3, section VII for troubleshooting procedures that will help isolate the cause of problems that may occur during operation. Section VII also contains recommended corrective actions.

2-4. **Battery Taps.** Make sure battery heater connectors and taps are connected as follows:

IMPORTANT :

1. Make sure battery heaters are connected and battery holdowns are tight.



2. Notify organizational maintenance to check batteries for position of battery taps.

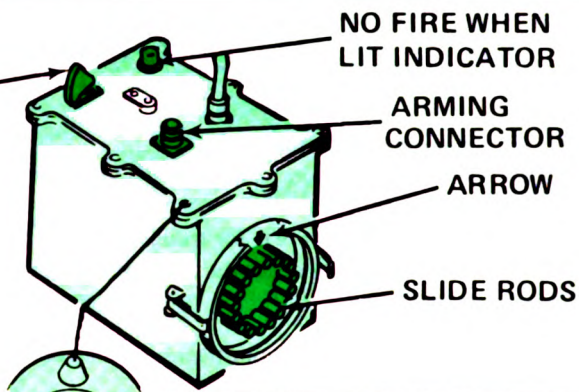
FIRING INTERRUPTER

1

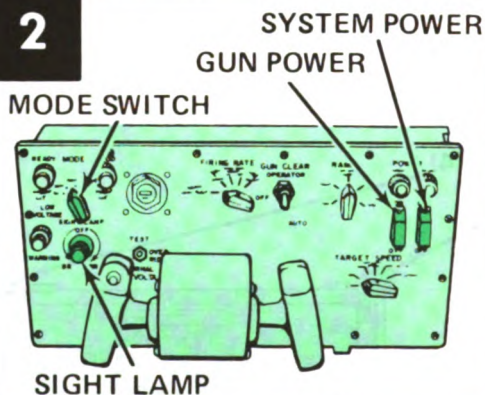
**FIRING
INTERRUPTION
SWITCH**

ON - interruption as
selected.

OFF - bypasses
interruption.



2



3

**TO ADJUST THE
FIRING INTERRUPTER**

SYSTEM POWER switch - OFF
LOW VOLTAGE switch - NORMAL
MODE switch - GRD
SIGHT - CAGED
SYSTEM POWER switch - ON
GUN POWER switch - ON
SIGHT LAMP INTENSITY - as
desired

4

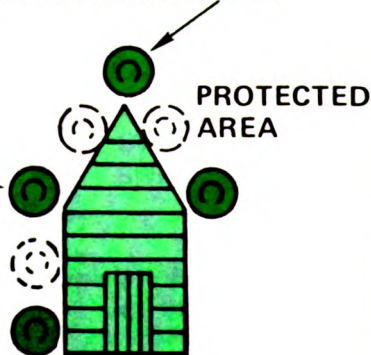
1. Remove cover from firing interrupter.
2. Track up left side of object to be protected, keeping object outside large site reticle until bottom of large reticle is even with top of object.

NOTE

Each rod provides approximately a 20 degree azimuth protection and the corresponding cannon elevation protection at time of setting.

**TRACK RIGHT UNTIL LIGHT GOES
OUT THEN PULL NEXT ROD.**

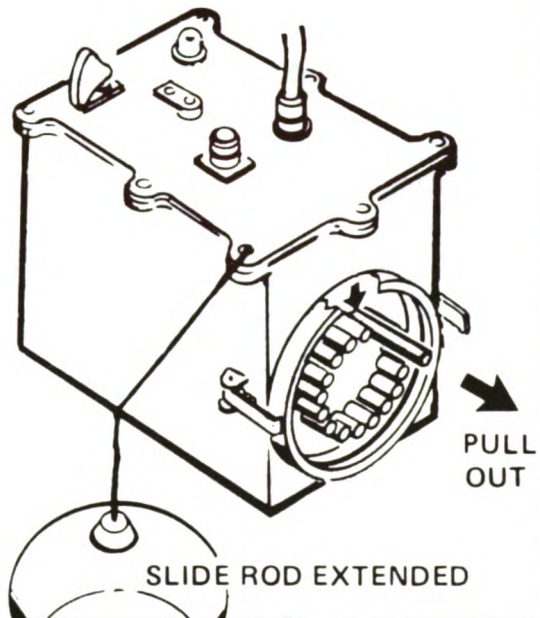
**PULL FIRST
SLIDE ROD
HERE**



FIRING INTERRUPTER - CONTINUED

5

3. Pull slide rod nearest the arrow, until **NO FIRE WHEN LIT** indicator lights. If two rods are equally near arrow pull both rods. This will provide approximately a 40 degree azimuth protection. Reposition mount if approximately a 20 degree area is desired.



6

**WARNING**

If the object to be protected is a mile or more away from the gun, block the sector in elevation, as the object may be hit by fire at high gun elevations or debris from air bursts.

4. Track along top of object to be protected until indicator light goes off. If fire interruption under reticle is still desired, pull out rod nearest to the arrow until light comes on. Repeat until sector or sectors to be protected are covered

SAFETY CHECK

Trace outline of object or objects to be protected with center of reticle. The **NO FIRE WHEN LIT** indicator light should stay on during tracing object outline or when center of reticle is passed into any portion of protected area.

END

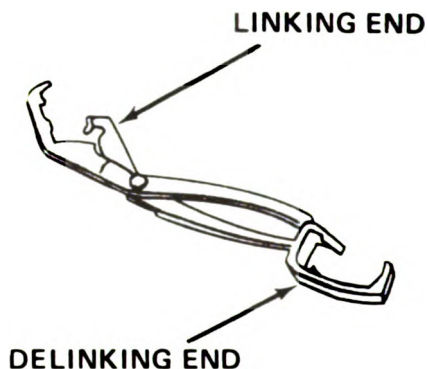
LINKER - DELINKER OPERATION



WARNING



Electrically primed ammunition can fire if exposed to high-power radio frequency fields. Avoid contact of any kind with primer, especially with metal objects. See TM 9-1300-200 for ammunition handling instructions. Re-chambering of live ammunition is prohibited.



LINKING

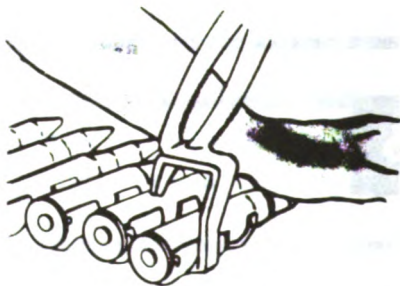


- Insert round in link.



- Clamp round into link. Make sure link tabs engage extractor groove.

DELINKING



- Insert tip of tool between round and link flange.



- Pull tool down to release round

LOADING THE 500 ROUND AMMUNITION STORAGE UNIT

1

OPEN —

Top covers, rear door and bellmouth door.

REMOVE —

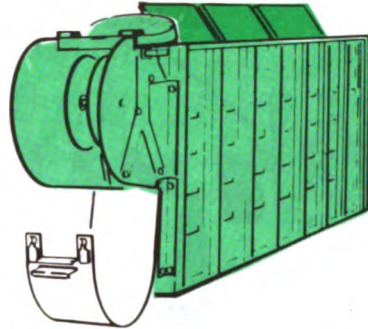
Feed chute cover.

LOADING —

- a. Set **BRAKE-CLEAR AND BRAKE** switch to **CLEAR AND BRAKE**.

Rotate cannon two (2) revolutions to clear cannon. Check exit chutes to make sure they are clear.

- b. Set **BRAKE-CLEAR AND BRAKE** switch to **BRAKE** to time cannon. Do not hold switch over 10 seconds in a one minute period. Make sure timing pin is released.



- c. Elevate cannon to between 5 and 10 degrees to facilitate loading.
- d. Make sure that **GUN and SYSTEM POWER** is **OFF**, firing contact assembly disconnected and arming connector removed.

2

WARNING

Electrically primed ammunition can fire if exposed to high-power radio frequency fields. Avoid contact of any kind with primer, especially with metal objects. See TM 9-1300-200 for ammunition handling instructions. Rechambering of live ammunition is prohibited.



IMPORTANT — Make sure to use ground cover when ammunition is strung outside vehicle.

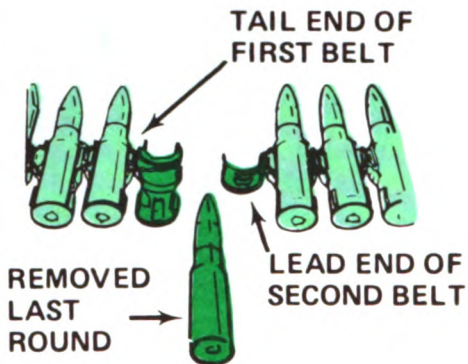
Check that all rounds in belts are correctly linked. After all rounds are checked for correct linking, lay out ammunition belts so that open side of links are up.



LOADING THE 500 ROUND AMMUNITION STORAGE UNIT – CONTINUED

3

▲ Splice ammunition belts.



▲ With M25 delinker, remove last round from end of first belt (page 2-24).



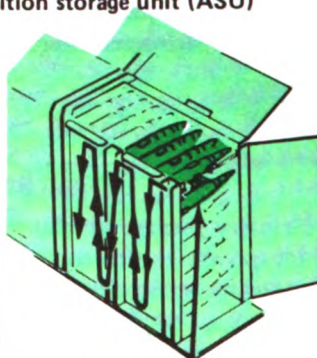
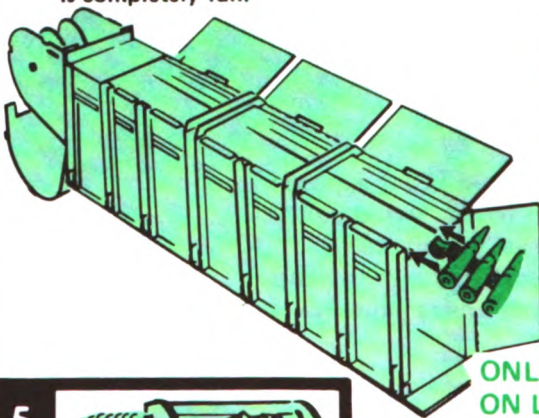
▲ Join lead end of second belt to tail end of first belt.



▲ With M25 linker clamp round in link (page 2-24).

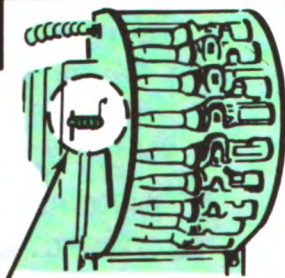
4

Load ammunition, links down, single link first. Suspend in loops from support rails. Load 1 link and 8 rounds hanging, 2 rounds on top of rail followed by loops of 24 each. Push loops forward until the ammunition storage unit (ASU) is completely full.



CAUTION
ONLY ONE ROUND BELOW RAILS ON LAST STRING AS SHOWN.

5

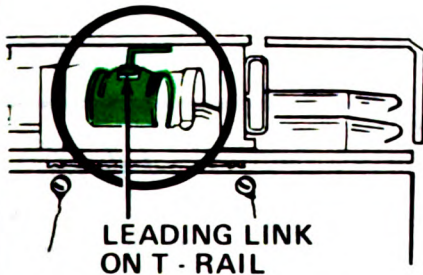


LOCKING MECHANISM SPRING LEVER

Pull ammunition out of ammo storage unit while holding the spring lever rotated.

LOADING THE 500 ROUND AMMUNITION STORAGE UNIT— CONTINUED**6**

Pull ammo out of bellmouth and insert in chuting. Push toward feeder.

**7****CAUTION**

Do not hold BRAKE-CLEAR AND BRAKE switch in the CLEAR AND BRAKE position longer than 10 seconds, during any one-minute interval.

Start ammo into feeder so links are on the T-rail stripper guide. Hold BRAKE-CLEAR and BRAKE switch to BRAKE. Strip 1 round by rotating the barrel cluster.

8

IMPORTANT: DO NOT release switch until barrel cluster has stopped rotating.

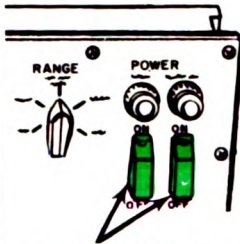
Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE — Rotate cannon barrels to clear cannon. Clear all exit chutes. Close and secure all doors, covers, and install feed chute cover. Connect fire contact assembly and install arming connector.

END

UNLOADING THE 500 ROUND AMMUNITION STORAGE UNIT

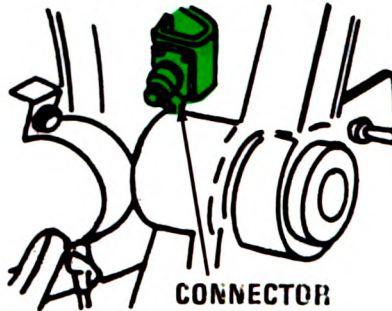
1

Make sure that GUN and SYSTEM POWER switches are OFF, firing contact assembly disconnected, and arming connector removed.



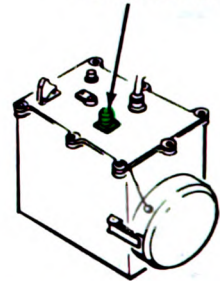
GUN and SYSTEM POWER switches

FIRING CONTACT ASSY



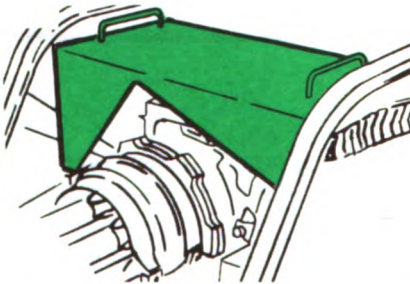
CONNECTOR

ARMING CONNECTOR



2

Remove gun shield, elevate cannon to between 5 and 10 degrees to facilitate unloading.



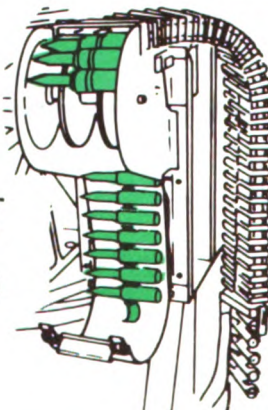
3



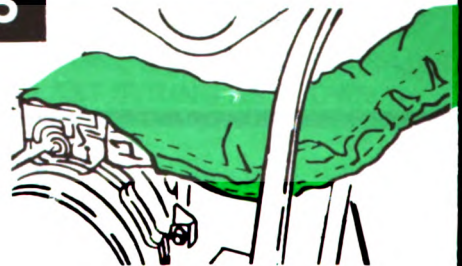
Remove the feed chute cover, disconnect the feed chute at the feeder, and separate the ammunition belt. Reinsert round in empty link.

4

Open bellmouth door, separate ammunition belt, and pull ammunition through feed chute. Reinsert round in empty link.



5



Connect feed chute to the feeder and reinstall chuting cover.

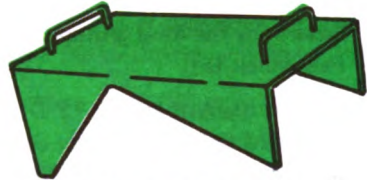
UNLOADING THE 500 ROUND AMMUNITION STORAGE UNIT – CONTINUED

6

Hold BRAKE—CLEAR AND BRAKE switch to BRAKE and rotate the barrel cluster to clear the cannon and feeder. Clear exit chute of all rounds.



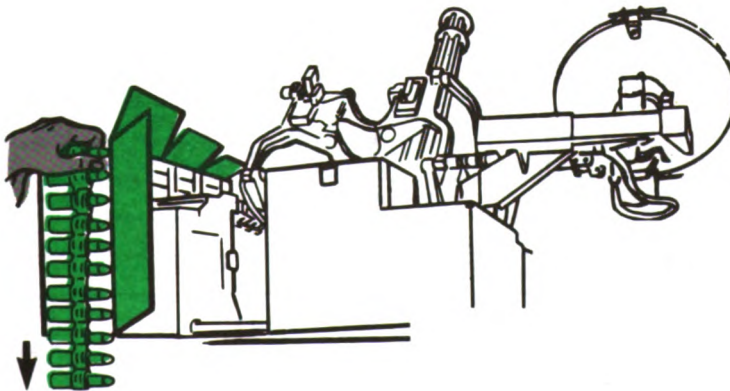
7



Install gun shield.

8

Place a ground cover to the rear and under the ammunition storage unit. Open top doors, rear door, and remove ammunition through the rear of the ammunition storage unit. Rotate locking lever on bellmouth if ammunition loop is held by the forward lock. Close and secure all storage unit doors and bellmouth door.

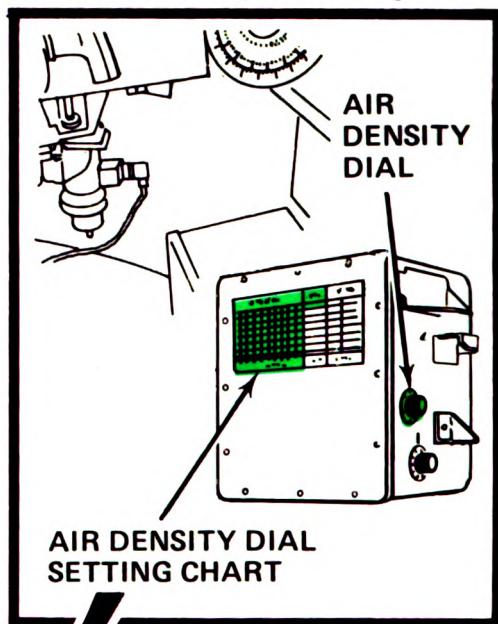


SIGHT CURRENT GENERATOR

AIR DENSITY SETTING

2-5. Set the AIR DENSITY switch dial on the sight current generator according to local altitude and temperature. Do this as follows:

1. Determine the local altitude in feet. Determine the local temperature in degrees Fahrenheit (F).
2. Look at the AIR DENSITY DIAL SETTING CHART on sight current generator or ammunition storage unit.
3. Refer to part of chart that applies to air density. Select the column and line that most nearly represents the altitude and temperature.
4. Trace up the pertinent altitude column to the proper temperature line.
5. Note the numerical value where the altitude column and temperature line meet.
6. Set the AIR DENSITY switch dial to the indicated value.



AIR DENSITY DIAL SETTINGS											TEMPERATURE IN DEGREES FAHRENHEIT	MUZZLE VELOCITY DIAL SETTINGS	
.95	.95	1.00	1.05	1.05	1.10	1.15	1.20	—	—	—	—70	8	9
.90	.90	.95	1.00	1.00	1.05	1.10	1.15	1.20	1.20	—	—50	8	9
.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	1.15	1.20	—30	7	8
.80	.80	.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	0	7	8
.75	.75	.80	.80	.85	.90	.90	.95	1.00	1.00	1.05	30	6	7
.70	.70	.75	.75	.80	.80	.85	.90	.90	.95	1.00	70	5	6
—	—	.70	.70	.75	.75	.80	.85	.85	.90	.95	90	5	6
—	—	—	.70	.70	.75	.75	.80	.80	.85	.90	130	4	5
10	9	8	7	6	5	4	3	2	1	0		0 — 36	36 — 72
ALTITUDE IN FEET X 1000												BARREL CLUSTER ROUNDS FIRED X 1000	

NOTE

When setting air density dial, use altitude column closest to actual determined altitude. For example, if actual altitude is 6540 feet, use the 7 x 1000 column.

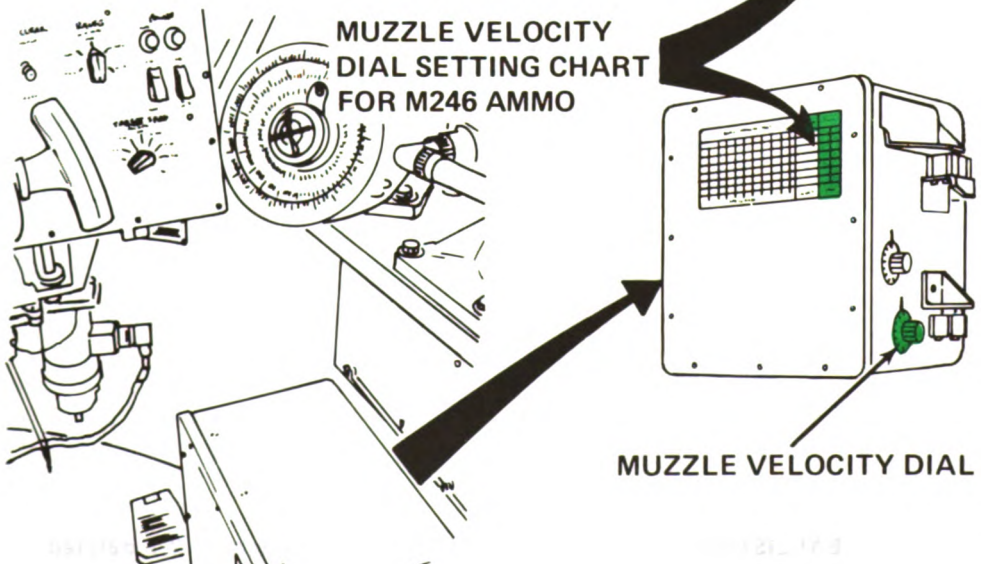
SIGHT CURRENT GENERATOR – CONTINUED**MUZZLE VELOCITY SETTING**

2-6. Set the MUZZLE VELOCITY switch dial on the sight current generator to compensate for type of ammo, temperature changes, and barrel cluster wear. Do this as follows:

1. Check the system log book and determine the number of total rounds fired on barrel cluster. Determine the local temperature (same as used for air density setting).
2. For M246 ammo, look at the MUZZLE VELOCITY DIAL SETTING part of chart on sight current generator **or ammunition storage unit**. For M220 ammo, look at the chart on page 2-30.

AIR DENSITY DIAL SETTINGS											TEMPERATURE IN DEGREES FAHRENHEIT	MUZZLE VELOCITY DIAL SETTINGS	
.95	.95	1.00	1.05	1.05	1.10	1.15	1.20	—	—	—	—70	8	9
.90	.90	.95	1.00	1.00	1.05	1.10	1.15	1.20	1.20	—	—50	8	9
.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	1.15	1.20	—30	7	8
.80	.80	.85	.85	.90	.95	.95	1.00	1.05	1.10	1.10	0	7	8
.75	.75	.80	.80	.85	.90	.90	.95	1.00	1.00	1.05	30	6	7
.70	.70	.75	.75	.80	.80	.85	.90	.90	.95	1.00	70	5	6
—	—	.70	.70	.75	.75	.80	.85	.85	.90	.95	90	5	6
—	—	—	.70	.70	.75	.75	.80	.80	.85	.90	130	4	5
10	9	8	7	6	5	4	3	2	1	0		0 — 36	36 — 72
ALTITUDE IN FEET X 1000												BARREL CLUSTER * ROUNDS FIRED X 1000	

* REFER TO SYSTEM LOG BOOK



SIGHT CURRENT GENERATOR – CONTINUED**MUZZLE VELOCITY DIAL
SETTING CHART FOR M220 AMMO**

* BARREL CLUSTER ROUNDS FIRED M220	MUZZLE VELOCITY DIAL SETTING							
0 – 36,000	7	7	6	5	5	4	4	3
36,000 TO 72,000	8	8	7	7	6	5	5	4
TEMPERATURE IN DEGREES FAHRENHEIT	−70	−50	−30	0	+30	+70	+90	+130

*** REFER TO SYSTEM LOG BOOK**

3. Select the rounds fired category that conforms with total barrel cluster rounds fired. Select the numerical value for the temperature that is closest to the local temperature.
4. Set MUZZLE VELOCITY DIAL to the numerical value.

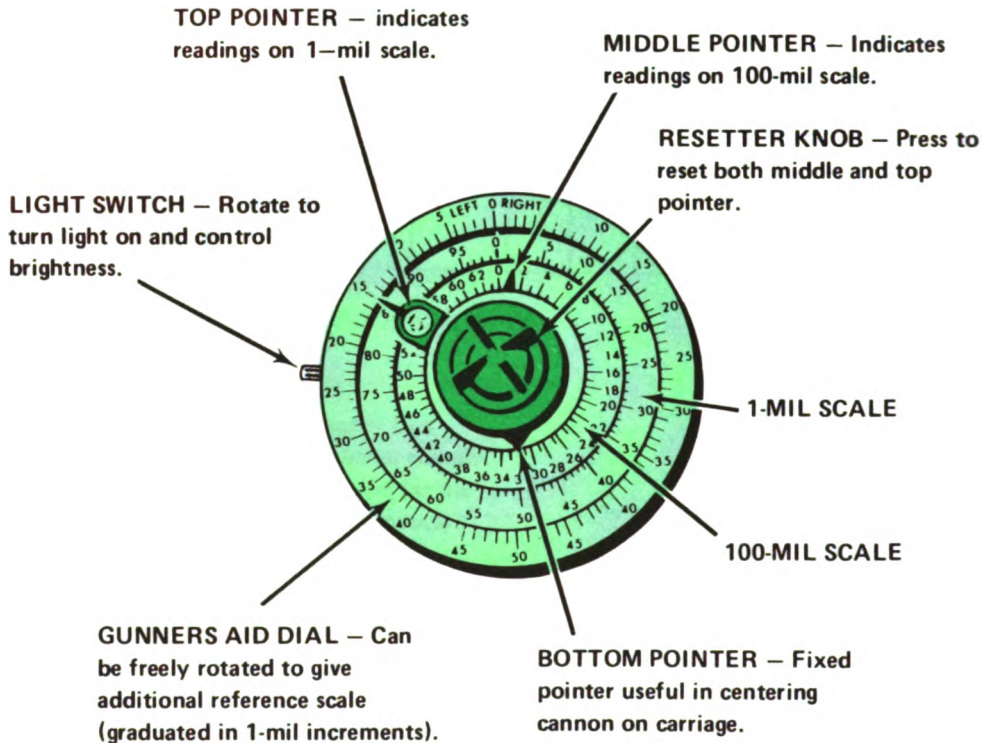
BALLISTIC CORRECTION CIRCUIT CARD – Paragraph 2-7 deleted.

SIGHT CURRENT GENERATOR – CONTINUED

BALLISTIC CORRECTION CIRCUIT CARD – deleted.

I

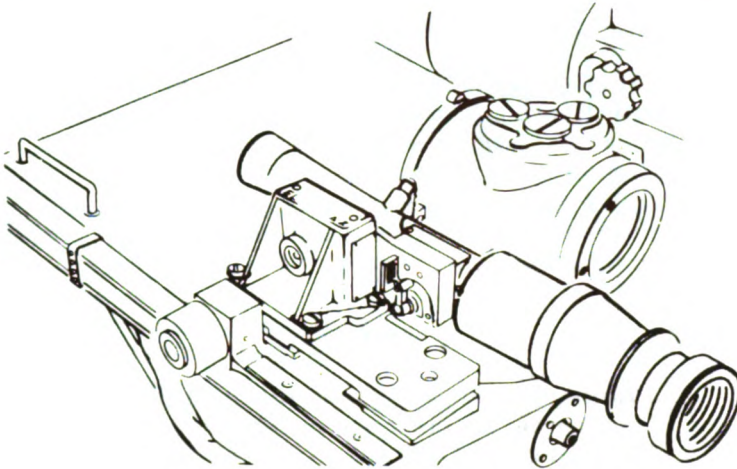
AZIMUTH INDICATOR



The azimuth indicator is normally used to lay indirect fire during the ground mode. Zero the top and middle pointers on the azimuth of the firing, or reference point. Make corrections by training the cannon as directed while observing the indicator.

The azimuth indicator can be used for any purpose that requires an accurate indication of cannon position in relation to a preset azimuth reference point.

M134 TELESCOPE AND M164 MOUNT

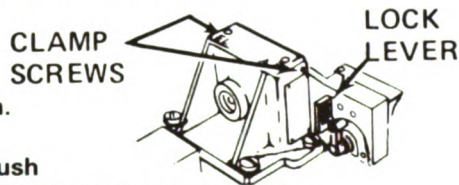
INSTALLATION

1. Check that mount is clean where the telescope attaches.

2. Loosen clamp screws.

3. Raise lock lever to up position.

4. Align scope and mount and push scope forward to stop. Move lock lever to down position.



5. Remove lens cover (pull off).

6. Align gun by training the M61 sight at a distant aiming point.



LENS COVER

7. Adjust azimuth and elevation screws to align telescope on distant aiming point. Tighten clamp screws and install lens cover (push on).

8. Boresight according to page 3-30.

REMOVAL**CAUTION**

Make certain that both telescope and case are completely dry before storing telescope in case.

1. Raise lock lever.

2. Slide telescope rearward off mount.

3. Check that lens cover is installed and store telescope in case.

HYDRAULIC SYSTEM

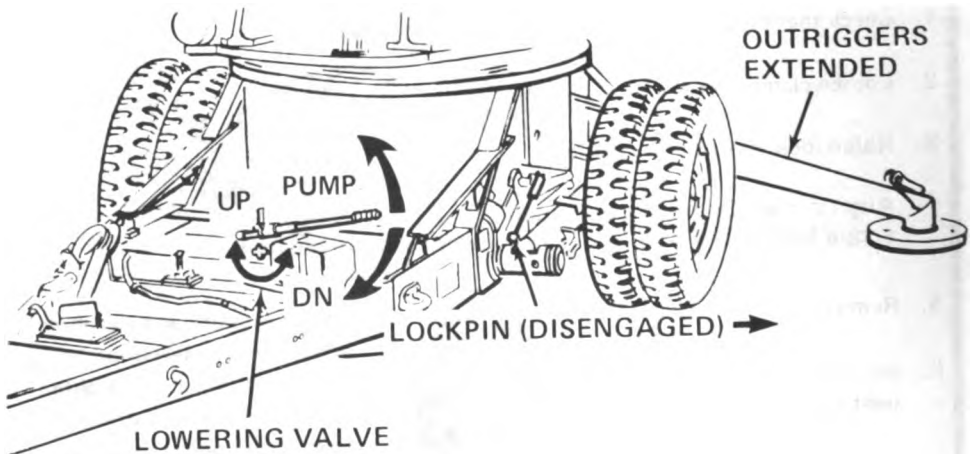
TO RAISE CARRIAGE AND STOW OUTRIGGERS

- VALVE - Rotate to UP and prime pump with handle in stow position.
- PUMP HANDLE - Extend and pump until lockpins can be engaged.
- LOCKPINS - Engage and stow handles under holdowns.
- OUTRIGGERS - Stow and lock.
- VALVE - Open after lockpins are engaged.
- DROP PAD - Down and locked until after prime mover is connected.
- BRAKES - Unlocked.



WARNING

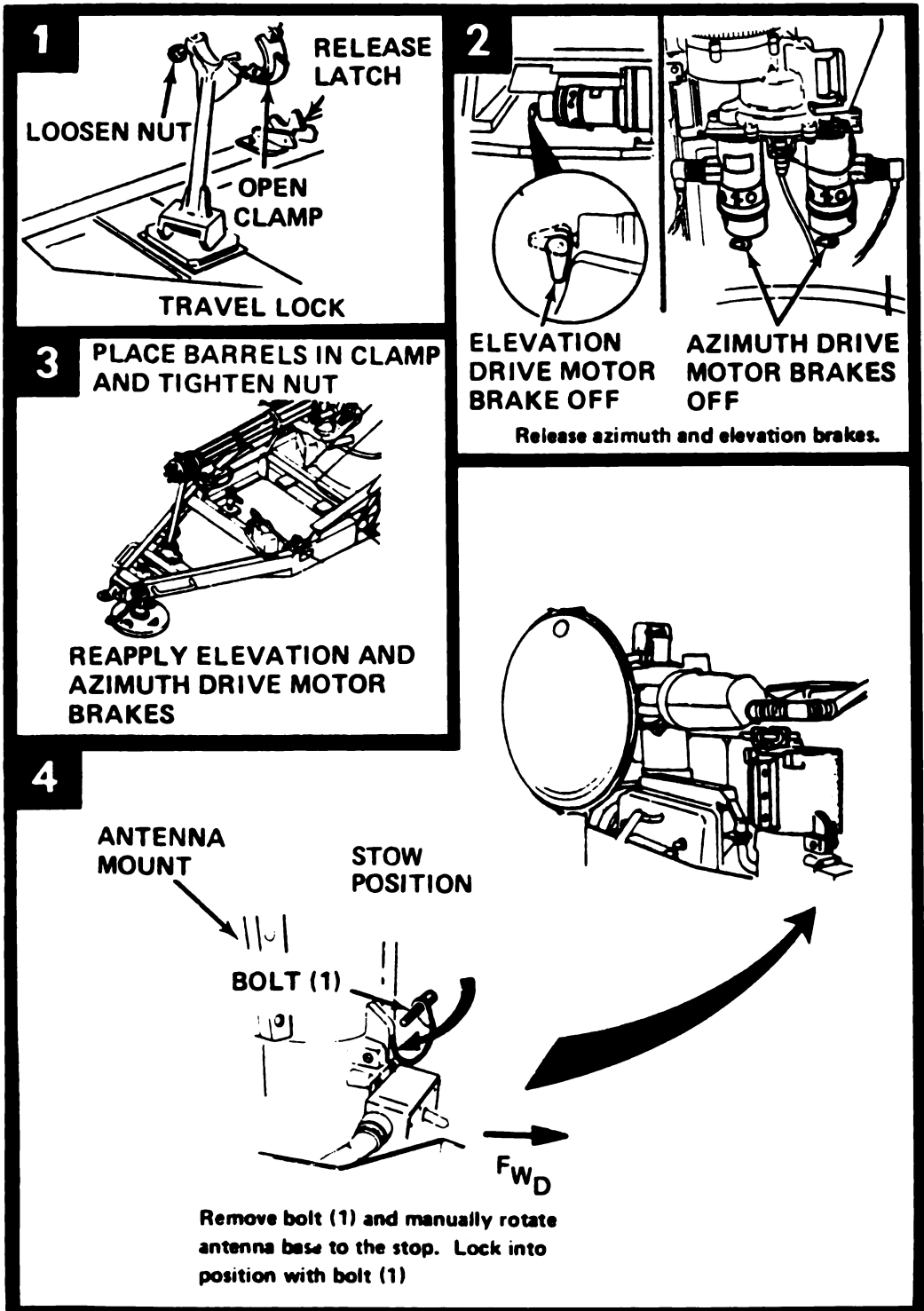
Before lowering carriage, make certain personnel are clear and outriggers and front drop pad will set on firm terrain.



TO EXTEND OUTRIGGERS AND TO LOWER CARRIAGE

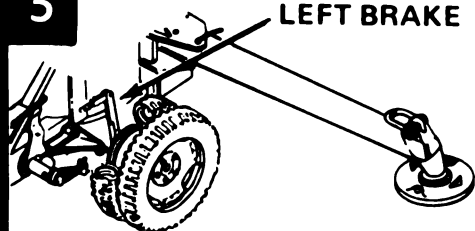
- BRAKES - Locked.
- DROP PAD - Down and locked (before disconnecting from prime mover).
- OUTRIGGERS - Extend and lock.
- VALVE - Rotate to UP and prime pump with handle in stow position.
- PUMP HANDLE - Extend and pump until both lockpins can be disengaged.
- LOCKPINS - Disengage.
- VALVE - Rotate to DN.

PREPARATION FOR TOWING AND TRAVEL



PREPARATION FOR TOWING AND TRAVEL - CONTINUED

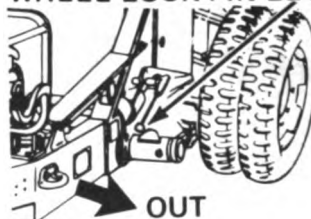
5



Set left and right brakes.

6

WHEEL LOCK PIN LEVER



Check that wheel lockpins are out.

7

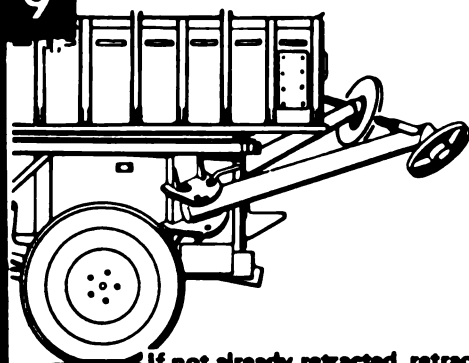
If system is emplaced on level ground, raise carriage and stow outriggers according to page 2-34. If there is any danger of system moving or tipping, leave outriggers extended until after system is connected to prime mover as shown in step 8.

8



Connect gun, safety chains and electrical cables to prime mover. Raise front drop pad.

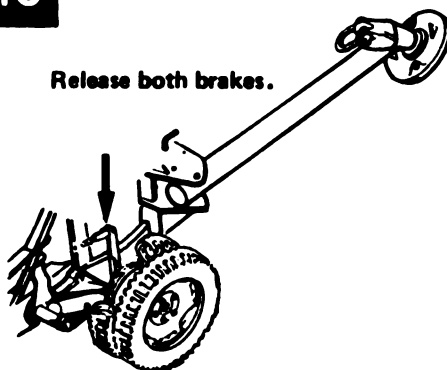
9



If not already retracted, retract outriggers and install pins.

10

Release both brakes.



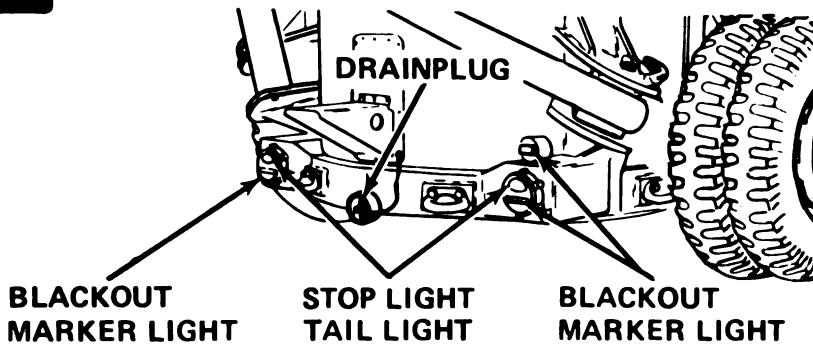
PREPARATION FOR TOWING AND TRAVEL - CONTINUED

11

Deleted.

12

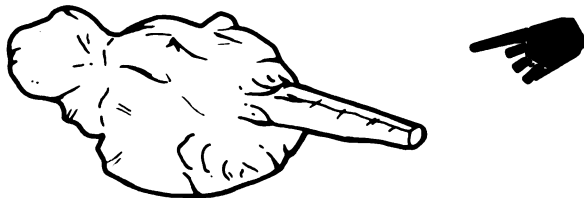
INSTALL DRAINPLUG AND CHECK RUNNING LIGHTS



13

NOTE

Wait 30 minutes after firing cannon to install gun mount cover.



Install gun mount cover.

14



Check that safety chains, and electrical cables are connected to prime mover. Front drop pad up and locked.

END

Digitized by Google CHANGE 4

PREPARATION FOR TOWING AND TRAVEL - CONTINUED

FORDING PROCEDURES

General.

2-7. For the purpose of this manual, fording operations are divided into two classes; i.e., shallow fording and deep fording. Shallow fording is towing the weapon through water of such depth that no preparation of equipment is necessary to prevent water damage. Deep fording is towing the weapon through water of such depth that it must be prepared to prevent water damage.

BEFORE FORDING

NOTE

Be sure drain plug is installed before fording.

Remove generator set and telephone from the gun carriage and stow them in the prime mover for deep fording.

NOTE

Detailed procedures for fording and swimming the prime mover (M561) are located in TM 9-2320-242-10.

MAXIMUM FORDING DEPTHS

Shallow fording includes water depths up to 17 inches. Deep fording includes water depths from 17 to approximately 37 inches with APU removed.

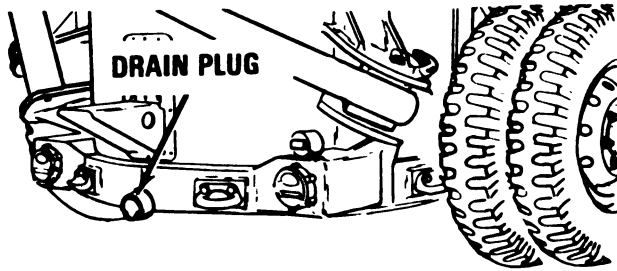
Movement of the water against the upstream side of the weapon will cause the water to build up on that side. Two or three inch allowance should be made for this effect, depending on stream velocity.

Movement of the weapon through the water will cause a build up of water against the front of the weapon, and the prime mover wheels and weapon carriage frame will cause turbulence and waves. Towing at very low speed will reduce this effect.

A rough stream bottom will cause the prime mover and towed weapon to bounce and make waves that may raise the water above the maximum allowable depth. A soft bottom may allow the weapon wheels to sink in causing the effective water depth to raise above that allowable maximum.

PREPARATION FOR TOWING AND TRAVEL

Be sure drain plug is installed in bottom of carriage.



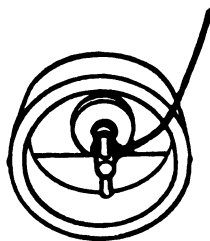
CAUTION

Don't go faster than two or three miles per hour (walking speed) when fording.

AFTER FORDING

Remount generator set and telephone on gun carriage.

Inspect weapon. Remove drain plug in bottom of carriage to allow trapped water to drain. Install drain plug.



GUN EMPLACEMENT



Select level area - (ten degrees max slope) and emplace gun.

CAUTION

Do not emplace gun on hard surfaces, such as rock or concrete. Gun will slide when fired.

8 MUZZLE CLAMP —
Proper for mode of fire.

9 ANTENNA —
Unstow
(page 2-35).

3 HAND BRAKES (2) —
Locked.

**7 CANNON—Elevation
and azimuth drive motor
brakes ON (page 2-12).**

6 PROTECTIVE COVERS —
removed and travel lock
stowed.

**5 CARRIAGE—Lowered,
(page 2-34).**

4 OUTRIGGERS (2) —
Extended and locked
(page 2-34).

**1 SAFETY CHAINS and
ELECTRICAL CABLES —**
Stowed in racks.

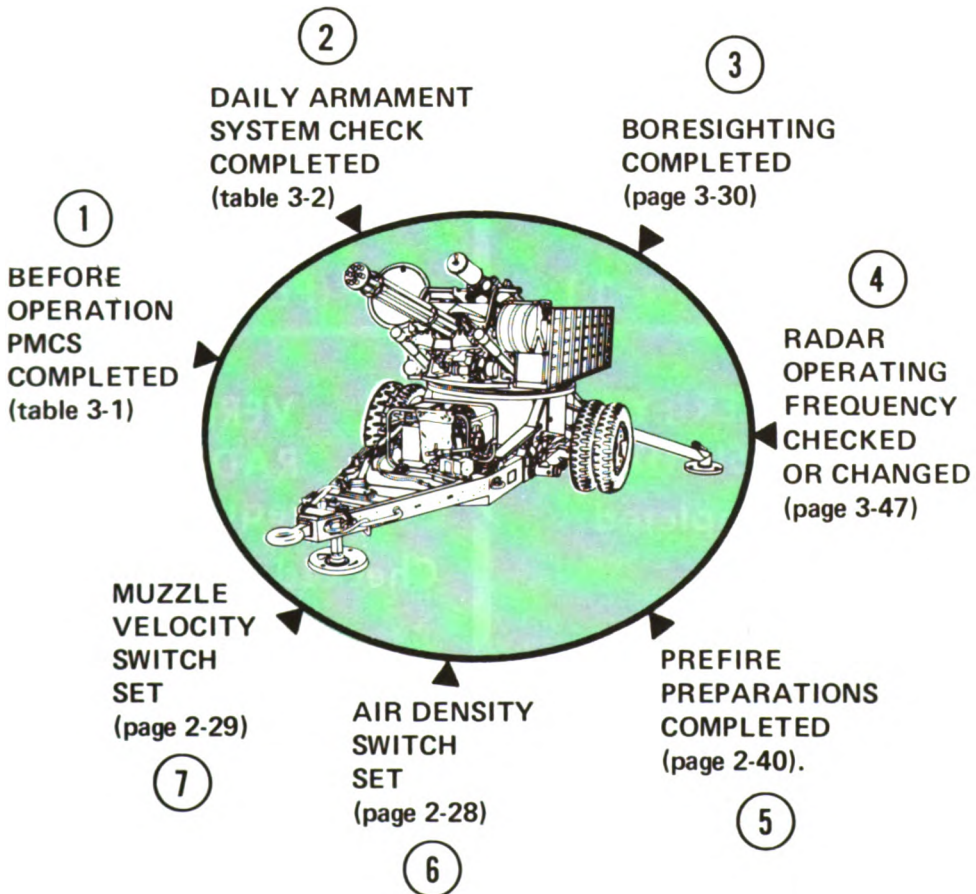
**2 DROP PAD — Down and locked
(page 2-18).**

10 AZIMUTH INDICATOR —
Set as required by
tactical situation.



PREPARATION FOR FIRING

2.8. General. The steps that follow are the final preparations performed before firing. First verify that all BEFORE OPERATION PMCS, DAILY ARMAMENT SYSTEM CHECKS, BORESIGHTING, AND RADAR OPERATING FREQUENCY CHECKS have been completed. Final preparations consist of setting the fire control circuits for certain variable conditions such as type of ammo to be used, muzzle velocity, and air density. This involves setting the AIR DENSITY and MUZZLE VELOCITY switches in correct position. Refer to the illustration below that shows a completely prepared, ready-to-fire system, normally prepared in the sequence indicated.



PREPARATION FOR FIRING – CONTINUED

2-9. Prefire Instructions. Follow these instructions to prepare your system for firing. If your daily PMCS, daily armament system check, and boresighting have been completed, your system should be in first class shape. In this case, all that remains are some mechanical procedures, visual checks, turn-on procedures, and simple last minute operational checks.

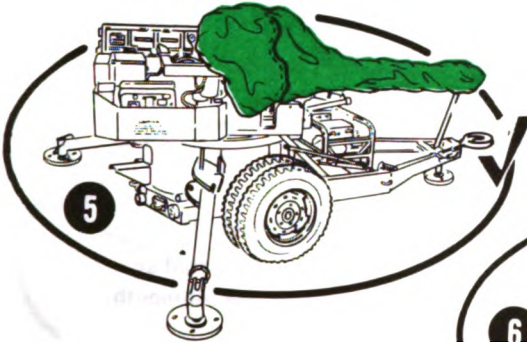


Make sure 1 through 4 have been completed before continuing.

PREPARATION FOR FIRING – CONTINUED

PROTECTIVE COVERS

Remove and stow



BARREL CLUSTER

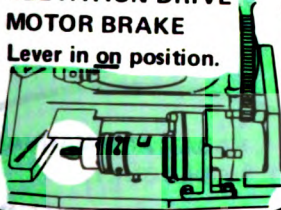
Unclamp from travel lock. Lay travel lock back and secure with quick-release latch. Gun DRIVE MOTOR BRAKE levers in on position.

6

ELEVATION DRIVE MOTOR BRAKE

Lever in on position.

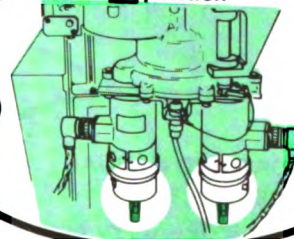
7



AZIMUTH DRIVE MOTOR BRAKES (two)

Levers in on position

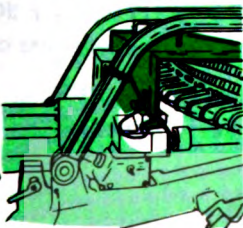
8



GUN SHIELD

Secure - with rear latches engaged and two quick-release pins installed.

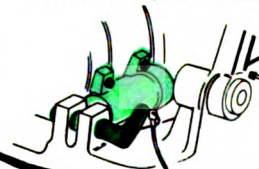
9



RECOIL ADAPTERS

Quick release pins installed.

10

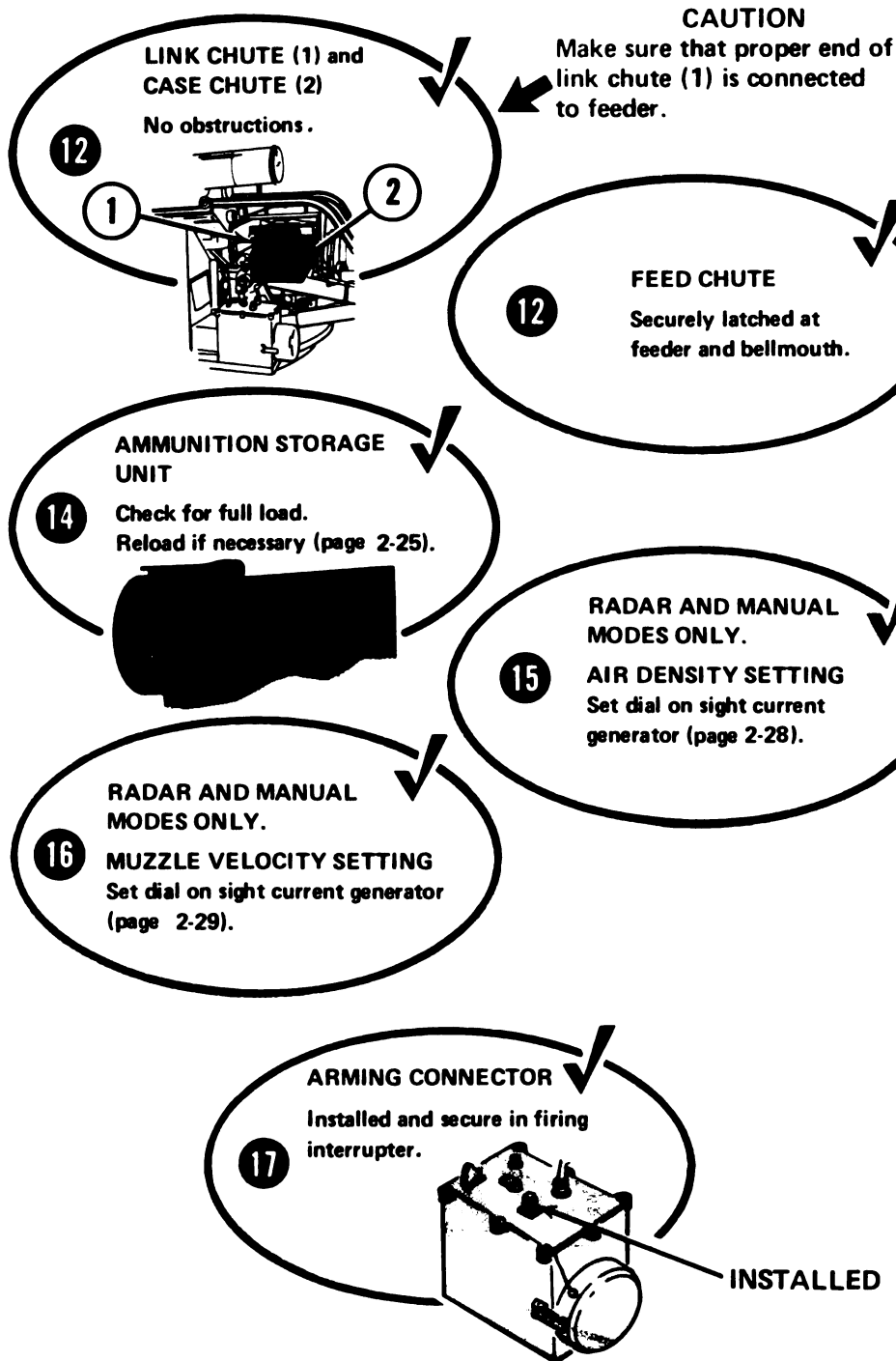


AUXILIARY POWER UNIT (APU)

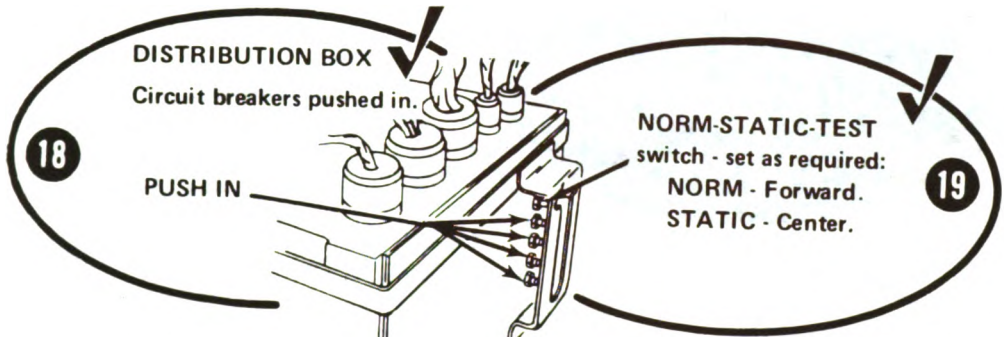
Start and adjust to keep batteries charged (page 2-77).

11

PREPARATION FOR FIRING – CONTINUED

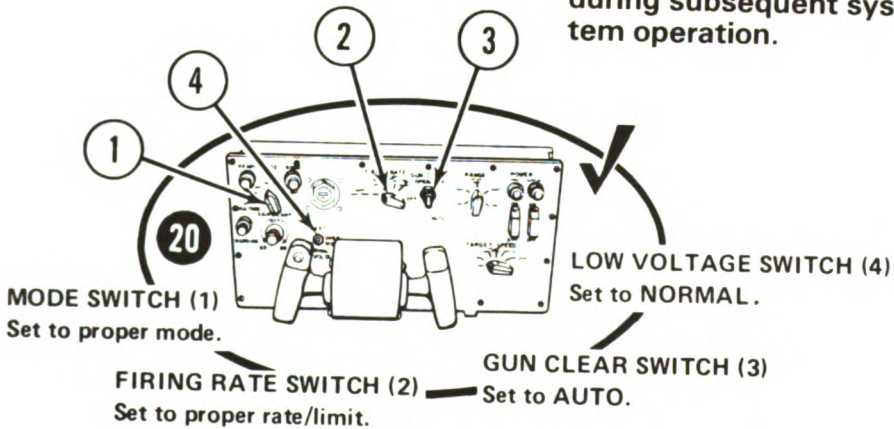


PREPARATION FOR FIRING - CONTINUED



CAUTION

If the low voltage switch is left in the override position, damage to the AN VPS-2 radar may occur during subsequent system operation.



PROCEDURE INDEX

Check/Procedure	Page
Manual Mode Check	2-44
Radar, Initial Control Setting	2-47
Radar Turn-On	2-48
Antenna Electrical Unstowing	2-49
Energize Radar to Radiate	2-50
Antenna Servo Drive Check	2-51
Clutter Lockon Test	2-53
Midrange Calibration Check	2-55

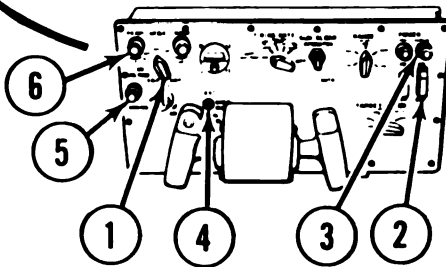
PREPARATION FOR FIRING - CONTINUED

MANUAL MODE CHECK

MODE SWITCH (1)
Set to MAN.

22 SYSTEM POWER (2) Set to ON.

SYSTEM POWER indicator (3)
lights.



21

FULLY
CW

Cage the SIGHT

Sight reticle lights
in approximately
10 seconds. Check
that READY WHEN
LIT indicator (6)
lights after two
minutes $\pm$ 15 seconds.
See NOTE.

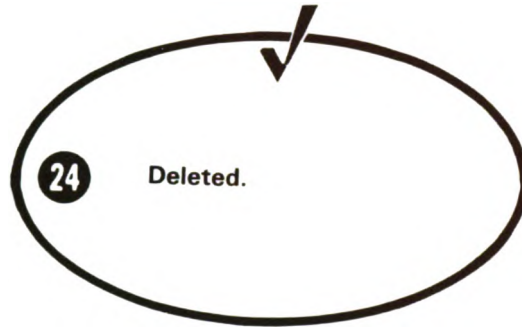
NOTE: If READY WHEN LIT indicator (6) doesn't light after warmup, or goes out during operation, reset all tripped circuit breakers on radar power supply and system distribution box. If breakers trip again, DO NOT reset the second time. Notify organizational maintenance.

23

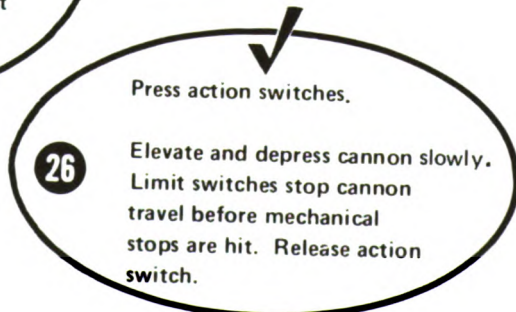
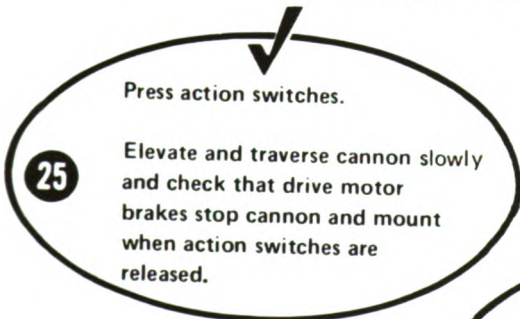
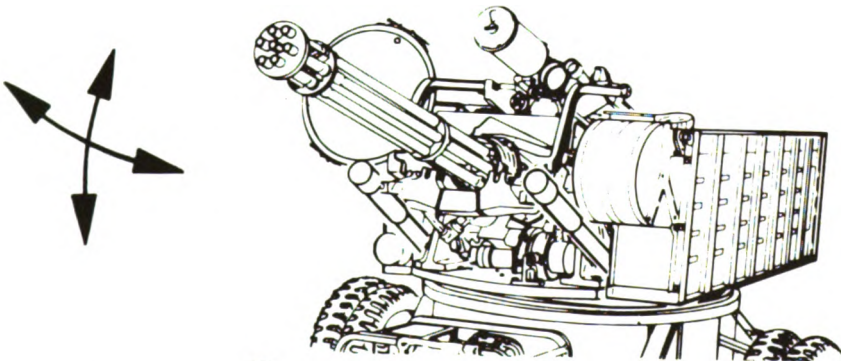
Check that LOW
VOLTAGE WARNING
indicator (5) is extin-
guished.

NOTE: If LOW VOLTAGE WARNING indicator (5) begins to flash or burn steadily with LOW VOLTAGE switch (4) in NORMAL position, troubleshoot system power (page 3-65).

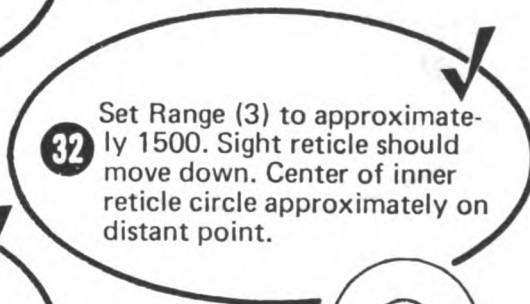
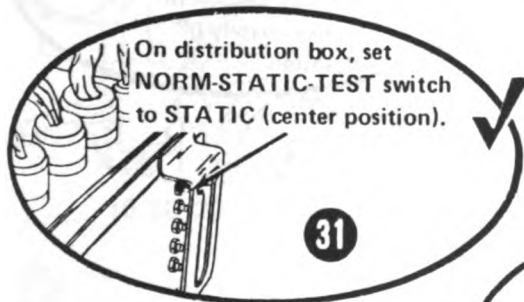
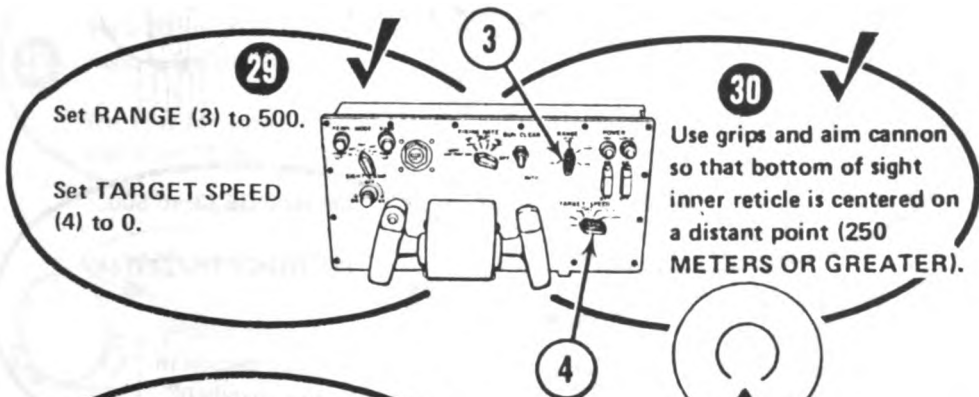
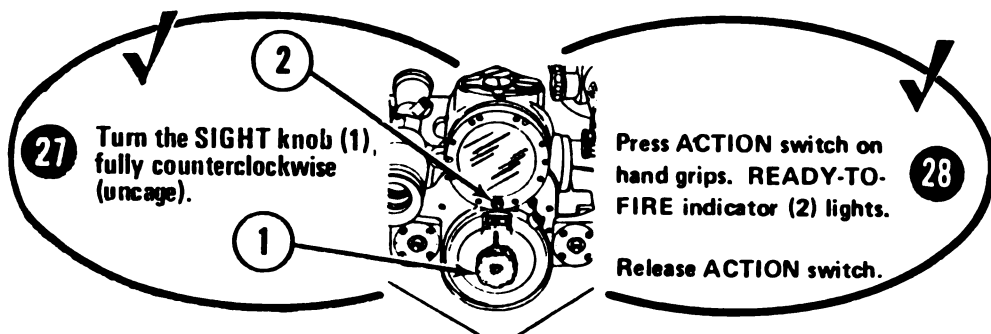
PREPARATION FOR FIRING - CONTINUED



WARNING
Alert everyone in area
before moving can-
non.



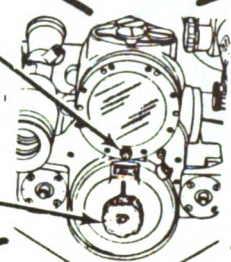
PREPARATION FOR FIRING – CONTINUED



PREPARATION FOR FIRING – CONTINUED

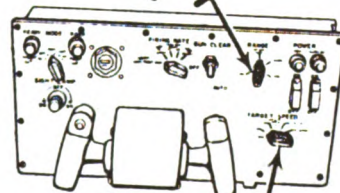
27 Turn the SIGHT knob (1), fully counterclockwise (uncage).

28 Press ACTION switch on hand grips. READY-TO-FIRE indicator (2) lights.
Release ACTION switch.



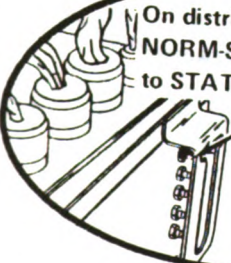
29 Set RANGE (3) to 500.
Set TARGET SPEED (4) to 0.

30 Use grips and aim cannon so that bottom of sight inner reticle is centered on a distant point (250 METERS OR GREATER).



On distribution box, set NORM-STATIC-TEST switch to STATIC (center position).

31



32 Set Range (3) to approximately 1500. Sight reticle should move down. Center of inner reticle circle approximately on distant point.

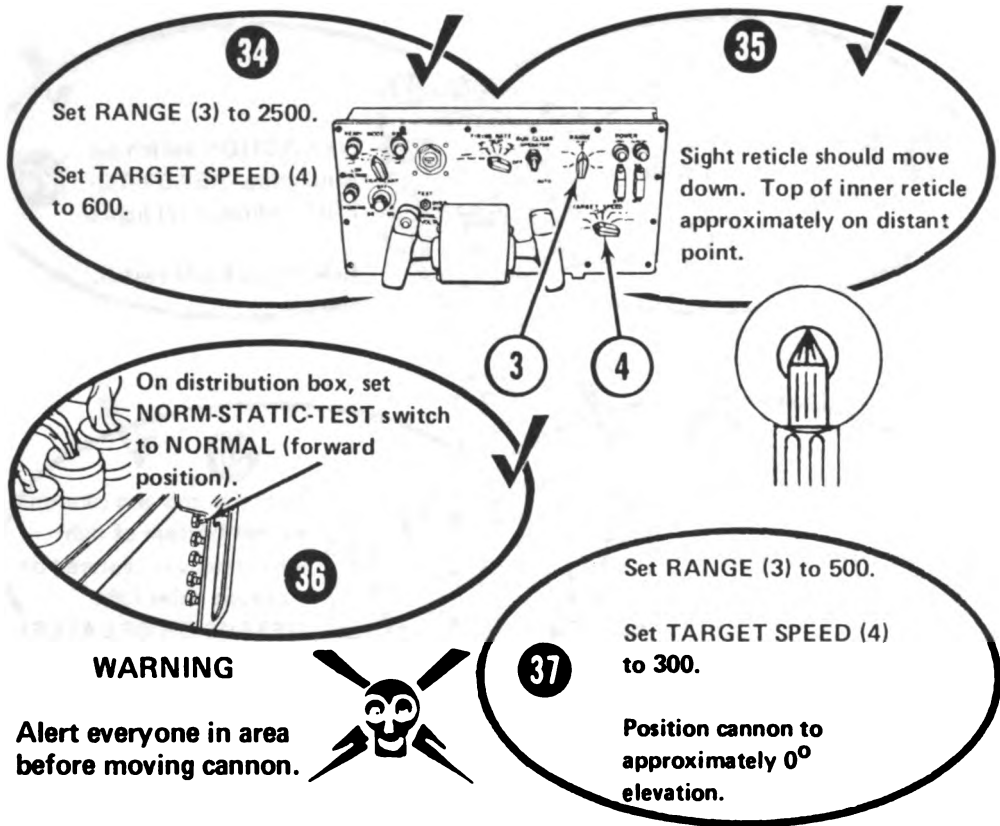


33 Push SIGHT CAGE switch (pushbutton left-hand grip). Sight reticle should move to center inner reticle approximately on distant point.
Release SIGHT CAGE switches.

RETICLE MOVES UP



PREPARATION FOR FIRING – CONTINUED



371 Record setting of MUZZLE VELOCITY and AIR DENSITY switches. Then set switches respectively to 1 and 0.7.

PREPARATION FOR FIRING – CONTINUED

WARNING

Alert everyone in area
before moving cannon.

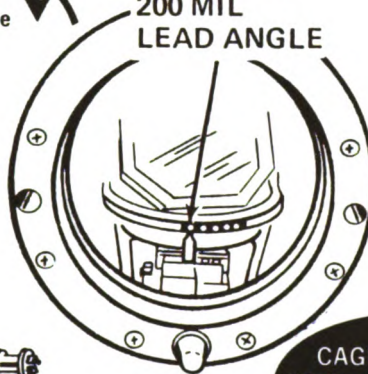


38

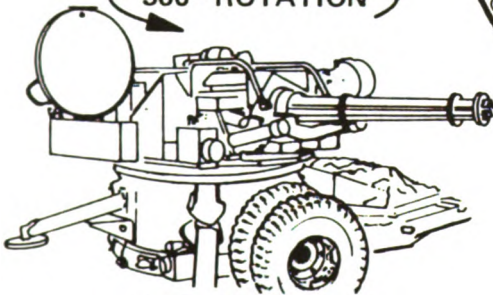
Press action switch. Use grips
to rotate mount while maintain-
ing a 200 mil lead angle (extreme
right or left dot in sight).

The time for one revolution
should be 16 to 20 seconds.

MAINTAIN
200 MIL
LEAD ANGLE



360° ROTATION



16 TO 20 SECONDS

CAGE THE SIGHT
RETURN TO SETTINGS
OF THE DAY

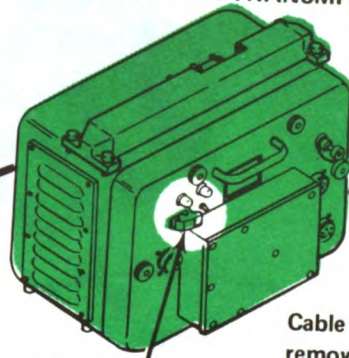


PREPARATION FOR FIRING – CONTINUED

RADAR INITIAL CONTROL SETTINGS

RECEIVER-TRANSMITTER

39



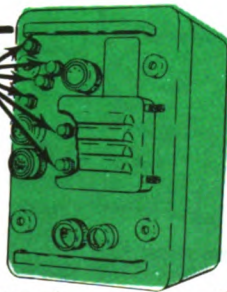
Cable guard removed.

CLUTTER LOCKON
Set to NORMAL.

POWER SUPPLY

Momentarily press
CB1 through CB6.

40



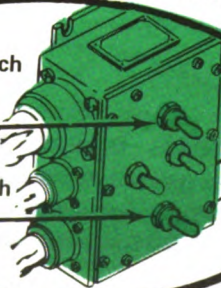
Cable guard removed.

STOW CONTROL

41

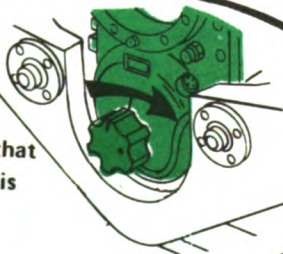
MODE switch
Set to
NORMAL.

MAINT switch
Set to OFF.

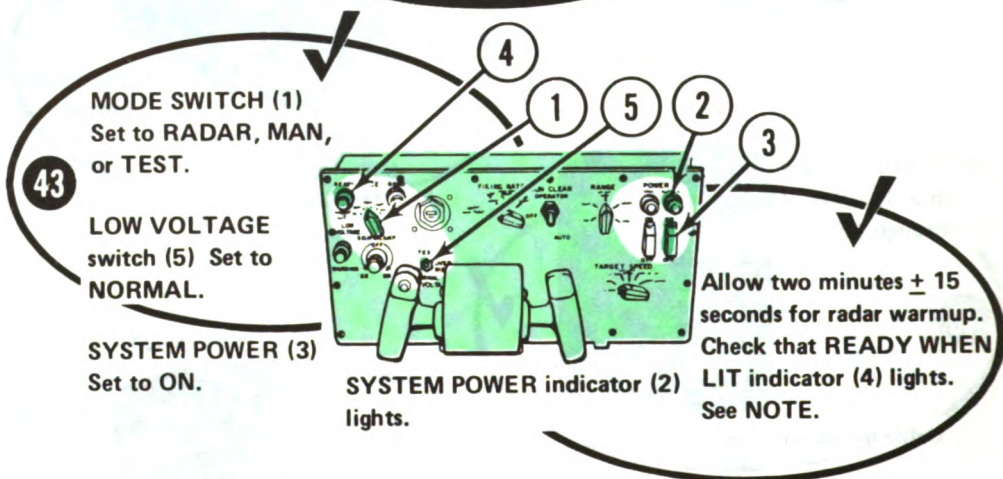


42

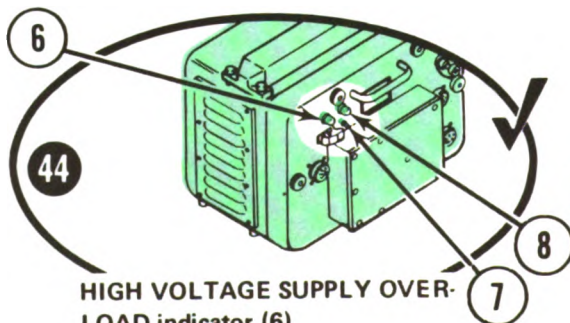
Check that
SIGHT is
caged.



RADAR TURN-ON



NOTE: If READY WHEN LIT indicator (4) doesn't light after warmup, or goes out during operation, reset all tripped circuit breakers on the radar power supply and system distribution box. If breakers trip again, DO NOT reset the second time. Notify organizational maintenance.



**HIGH VOLTAGE SUPPLY OVER-
LOAD indicator (6)**
Not lit.

**MODULATOR OVERLOAD
indicator (8)**
Not lit.

CAUTION

DO NOT set OVERLOAD RESET
switch to ON while footswitch and
action switch are pressed.

NOTE

If either OVERLOAD indicator is lit,
momentarily set OVERLOAD RESET
switch (7) to ON. Do not reset more
than two times. If overload persists,
notify organizational maintenance.

PREPARATION FOR FIRING – CONTINUED

ANTENNA ELECTRICAL UNSTOWING

CAUTION

Never rotate antenna by hand. If you force the antenna gearing without electrically releasing the brake, the brake may be damaged.

RECHECK SWITCHES

Control Assembly

- MODE-MAN or RADAR
- LOW VOLTAGE switch - NORMAL
- SYSTEM POWER-ON

45

Stow Control

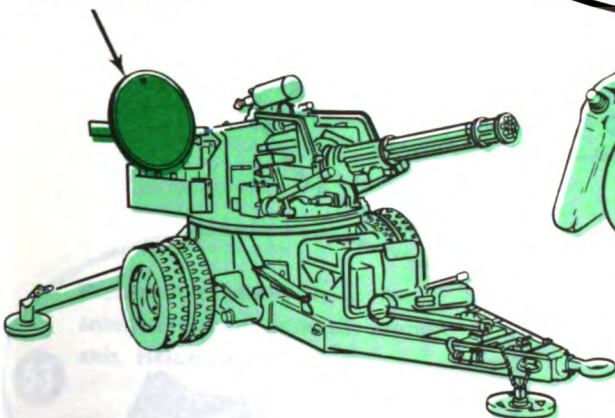
- MODE-NORMAL
- MAINT-OFF

Depress action switch on right or left hand grip.

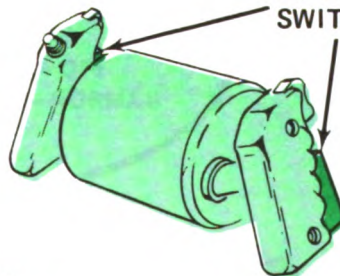
46

The antenna repositions on the cannon axis. Release action switch.

ANTENNA
OUT OF STOW

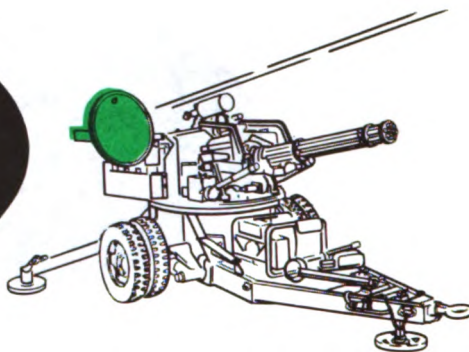


ACTION
SWITCHES



PREPARATION FOR FIRING — CONTINUED

**ENERGIZE
RADAR TO
RADIATE**



Deleted

PREPARATION FOR FIRING – CONTINUED

ANTENNA SERVO DRIVE CHECK

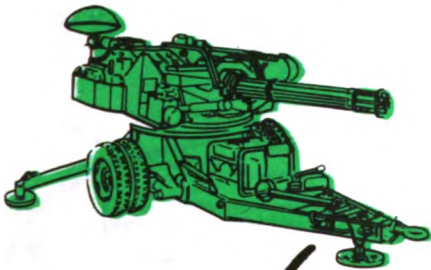
LOW VOLTAGE switch –
NORMAL
SYSTEM POWER-ON

50 Cannon positioned at approxi-
mately 0 degree elevation.
MAINT switch (3) – ON
MODE switch (2) – STOW

49

FULLY
CW

Cage the SIGHT.

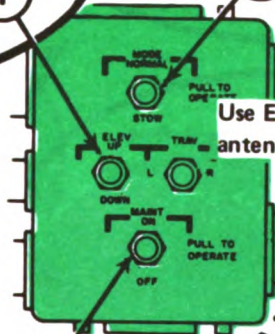


1

2

51

Use ELEV switch (1) and drive
antenna to upper limit.



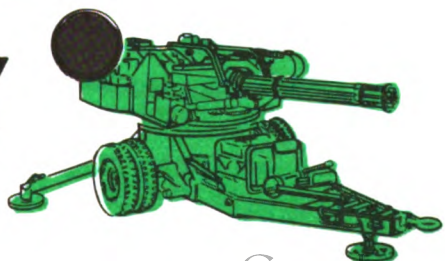
3

52

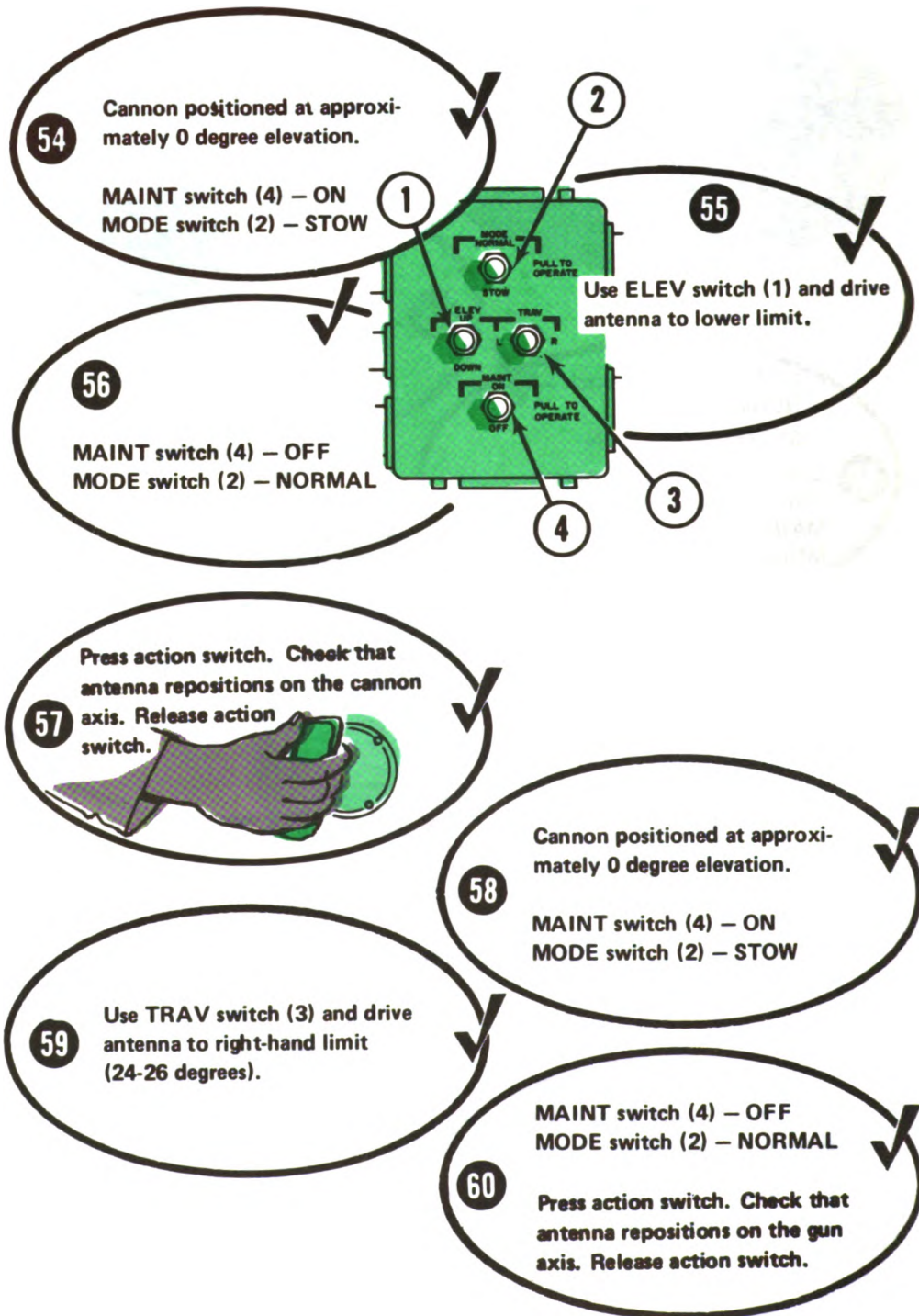
MAINT switch (3) – OFF
MODE switch (2) – NORMAL

Press action switch. Check that
antenna repositions on the cannon
axis. Release action switch.

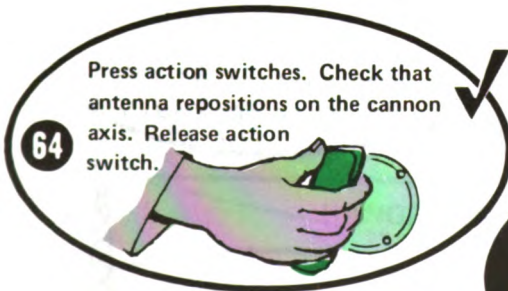
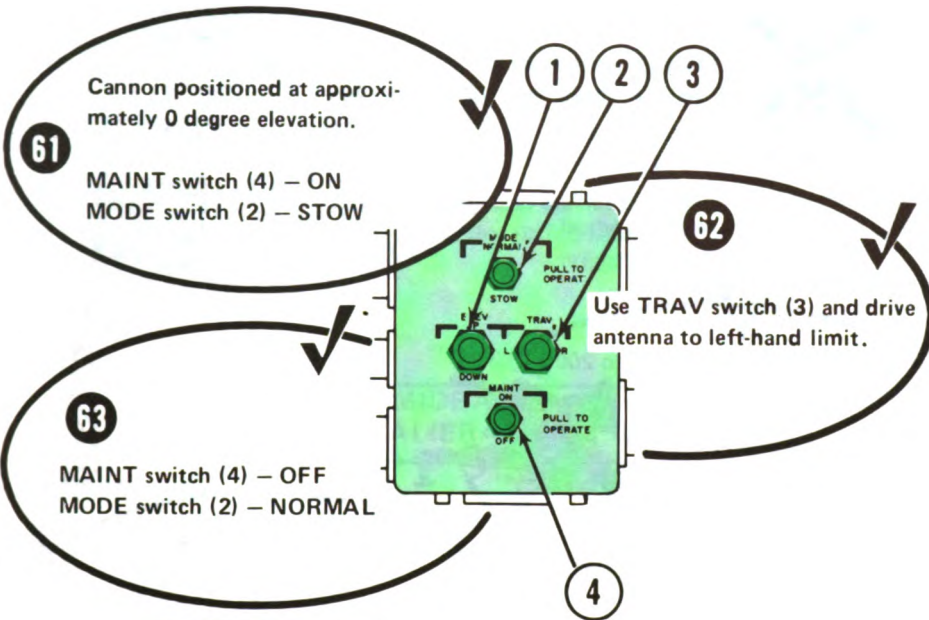
53



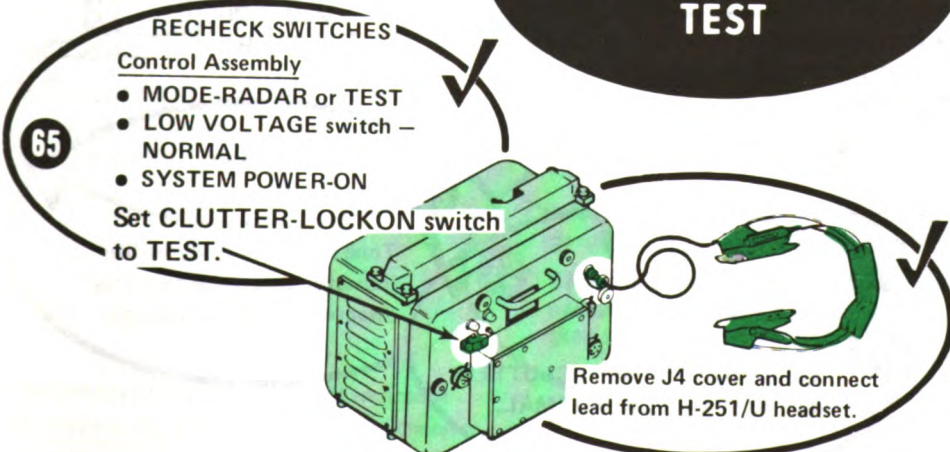
PREPARATION FOR FIRING – CONTINUED



PREPARATION FOR FIRING – CONTINUED



CLUTTER LOCKON TEST



PREPARATION FOR FIRING – CONTINUED



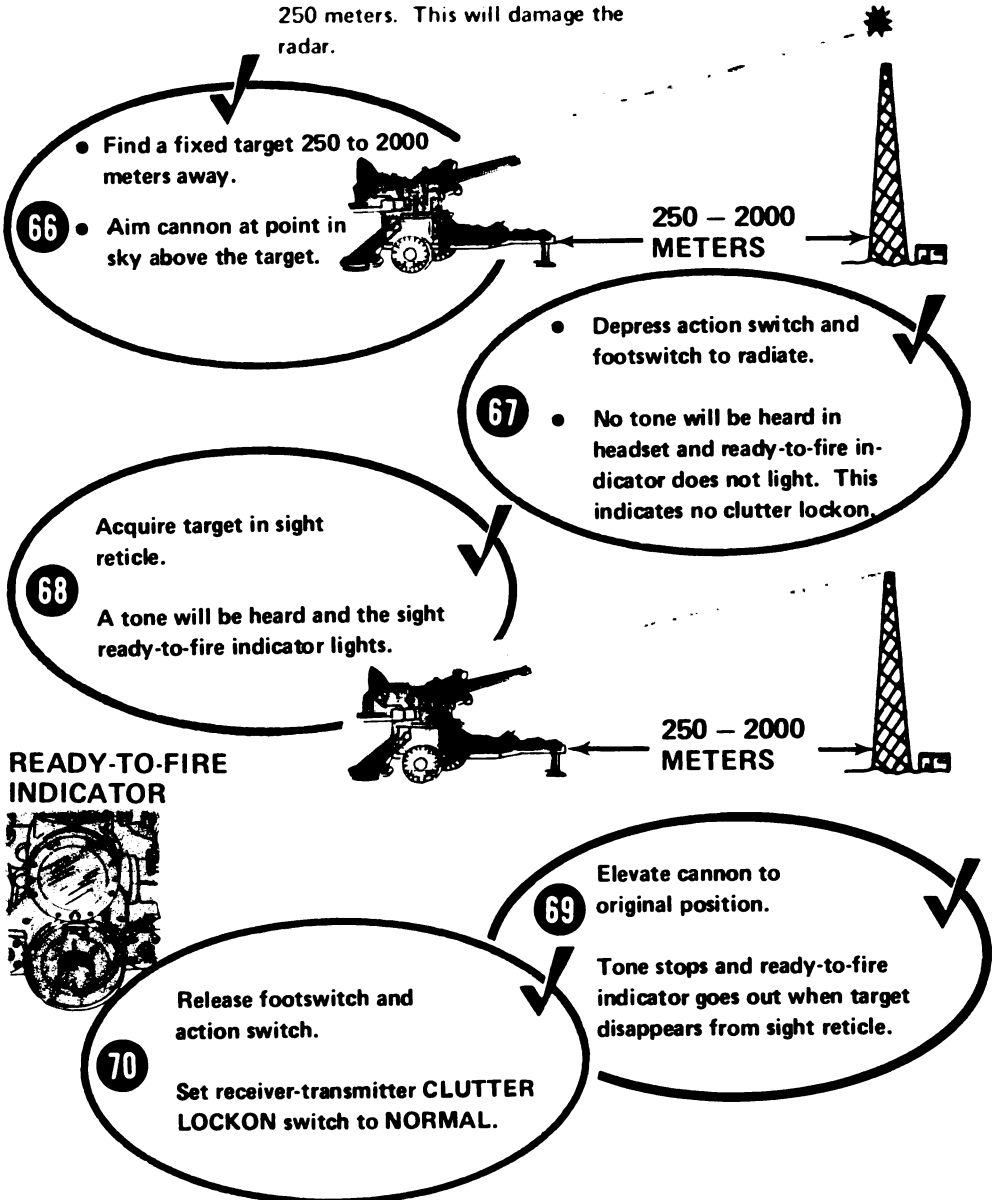
WARNING

Radar emissions are hazardous within three feet of the antenna.



CAUTION

Do not radiate at targets closer than 250 meters. This will damage the radar.

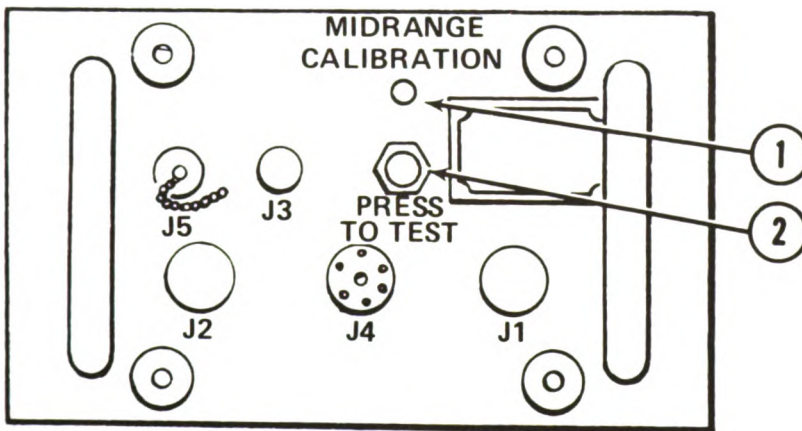


PREPARATION FOR FIRING – CONTINUED

MIDRANGE CALIBRATION CHECK

NOTE

The MIDRANGE CALIBRATION indicator (1) in the off state is dimly lit and flashing about once per second. In the on state, the indicator stays brightly lit.



RANGE COMPUTER

Push in PRESS TO TEST switch (2) and hold.

71

MIDRANGE CALIBRATION indicator (1) lights brightly within two seconds. See NOTE.

NOTE

If MIDRANGE CALIBRATION indicator (1) does not light or, after switch has been released, stays bright only momentarily – notify organizational maintenance.

Release PRESS TO TEST switch (2) – note that MIDRANGE CALIBRATION indicator stays lit for not more than three seconds, then resumes blinking. See NOTE.

72

PRECAUTIONS WHEN FIRING

PRECAUTIONS WHEN FIRING

2-10. When firing, always be prepared for any malfunction that could cause a potential hazard to personnel or equipment.

WARNING



If cannon cannot be cleared, keep it positioned in a direction so that possible damage or loss of life will not result if ammunition **COOK-OFF** occurs. If there is danger of a **COOK-OFF**, personnel should remain out of range or in shielded positions until after the barrels cool (about 30 minutes).



WARNING

COOK-OFF

If the gun clear switch is inadvertently left in the **OFF** position, the potential for **COOK-OFF** increases significantly.



COOK-OFF

If an unexpended round remains in a hot barrel, it may be detonated by the residual heat. This is called a **COOK-OFF**. If this happens, loss of life and destruction of the cannon can occur. Under all usual conditions, the **GUN CLEAR** switch on the control assembly will be set to the **AUTO** position so that the cannon clears automatically at completion of the firing cycle. However, if the switch has been left in the **OFF** position, or the cannon fails to clear for any other reason, the operator must attempt to clear the cannon immediately.

CAUTION

Torque muzzle clamp to 600-650 in.-lb every 12,000 rounds fired.

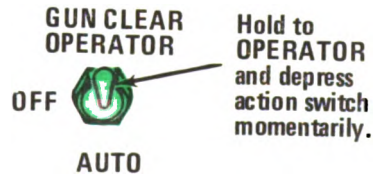
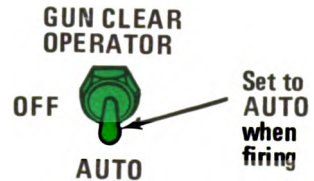
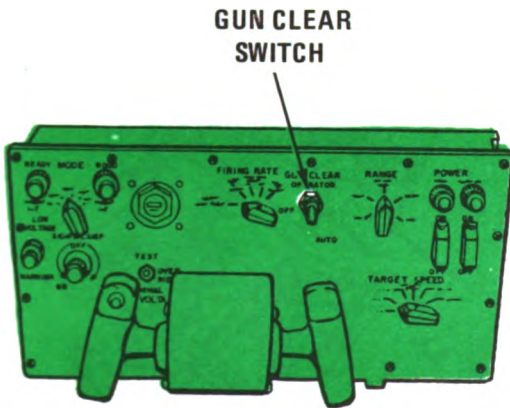
PRECAUTIONS WHEN FIRING - CONTINUED**Operator Clearing**

Aim the cannon towards a safe area.

Hold GUN CLEAR switch in OPERATOR position and depress ACTION switch momentarily. If this doesn't clear the cannon, do next step.

Quickly depress SYS PWR circuit breaker on the distribution box and try to clear the cannon. If cannon still will not clear, set SYSTEM POWER to OFF, take cover, and notify organizational maintenance.

NOTE: Using right hand to activate GUN CLEAR switch and left hand to depress left-hand ACTION switch will eliminate accidental activation of the firing trigger.

**WARNING****HANG-FIRE**

During firing, a round may not fire until after the clearing cycle starts. This is a HANG-FIRE and can result in death or injury to personnel and damage to the cannon. If ammunition doesn't fire normally, immediately stop firing and take cover. Dispose of defective ammo according to TM 9-1300-206 and/or local regulations.



PRECAUTIONS WHEN FIRING — CONTINUED

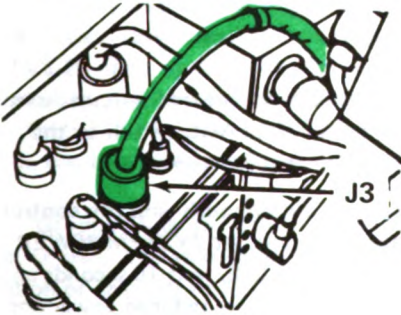
STOPPAGES

A stoppage is the result of an unexpected occurrence that interrupts the firing cycle and/or prevents the firing of the cannon on command from the gunner. Always clear the cannon immediately after a stoppage that occurs during a firing cycle (see operator clearing). This must be done to prevent a COOK-OFF. If cannon will not clear, take cover for 30 minutes until the barrels cool before trying to find the cause of the stoppage.

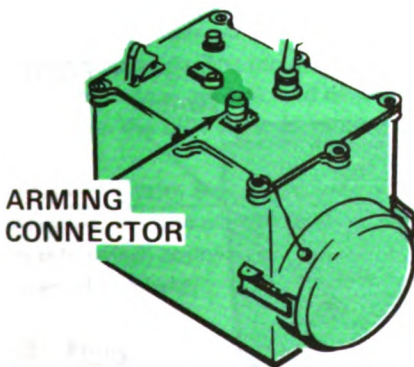
Correcting a Stoppage. After all danger of a cook-off has passed, attempt to isolate the cause of a stoppage by performing the following steps:

1. Set control assembly GUN CLEAR switch to AUTO. Inspect cannon and feed system. Make certain ammo is not binding in feed chute or storage can.
2. Attempt to fire a 10-round burst. If cannon fires and clears properly, continue operation.
3. If the cannon can be cleared manually but will not cycle electrically, (and no sign of obstruction can be found) check the following:

- a. W3P1 connector connected to J3 on the distribution box.



- b. The firing voltage connector is securely mounted with W3P2 securely connected.



- c. The arm-safe cable or arming connector securely connected to J2 on the firing interrupter.

4. If cannon still will not fire, notify organizational maintenance.

PRECAUTIONS WHEN FIRING – CONTINUED

LOW VOLTAGE PROTECTION CIRCUIT

If the **LOW VOLTAGE WARNING** indicator on the control panel flashes, it means that you should stop firing and take action to correct low voltage condition (Troubleshooting page 3-56).



WARNING



If involved in a tactical situation and the **LOW VOLTAGE WARNING** indicator begins to flash, immediately override low voltage protection circuit and continue firing.

CAUTION

Do not override low voltage protection circuit unless absolutely necessary. Low voltage conditions can cause permanent damage to sight gyro, radar, and sight current generator. The **VERRIDE** function is provided only for situations when the gunner must continue to fire in the manual, external or radar mode regardless of the consequences to the system.

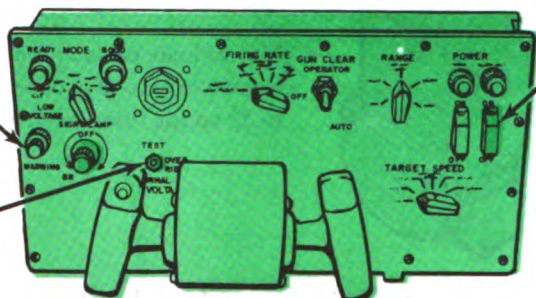
How to Override Low Voltage Protection Circuit.

1. When **LOW VOLTAGE WARNING** indicator is flashing, prevent automatic interruption of fire control power by setting the **LOW VOLTAGE** switch to the **VERRIDE** position and continue operating with reduced power.
2. When **LOW VOLTAGE WARNING** indicator is on continuously and fire control power has been interrupted, immediately cage sight gyro, set **SYSTEM POWER** switch to **OFF**, set **LOW VOLTAGE** switch to **VERRIDE**, wait 10 seconds and then reset **SYSTEM POWER** switch to **ON**. This will restore reduced power and allow operation of the system for a limited time.

**LOW VOLTAGE
WARNING
indicator**

**LOW
VOLTAGE
switch**

**SYSTEM POWER
switch**



FIRING

2-11. General. The system can be operated in four different modes. Selection of the proper mode and firing rate depends on the target and tactical circumstances. Both aerial and ground targets can be engaged. The following paragraphs describe each mode briefly, and provide step-by-step instructions for firing in the various modes.

2-12. Rader Mode. The greatest accuracy against aerial targets is obtained in the radar mode. Using radar, the fire control system automatically computes target speed and range data and furnishes lead angle information to the M61 sight.

2-13. Manual Mode. Normally used against aerial targets, but can be used against ground targets. A lead angle for moving targets, and superelevation for fixed or moving targets are provided by the fire control system. The gunner presets the TARGET RANGE and TARGET SPEED knobs on the control assembly to the anticipated target speed and to the range at which he expects to fire. The experienced gunner will also select, for reference, a terrain feature he knows to be at the same range at which he expects to fire. He will then concentrate on firing when he sees the target at the same distance as his reference point.

2-14. Ground Mode (NORM). Used against ground targets. The lead computing feature of the M61 sight is inoperative, and the sight is kept mechanically caged. However, it can still be used by aligning the target (depending on distance) with different areas on the sight reticle image. This is described on page 2-67. The M134 straight telescope or the AN/TVS-2B night sight can also be used to control fire. The choice depends on visibility and accuracy desired. Fire is adjusted by observing the splash of rounds and adjusting aim accordingly. In this ground mode, the servo-drive system remains energized so that the cannon can be elevated and traversed as required.

2-15. Ground Mode (STATIC). The cannon is fixed and used against a specific ground target or area. The servo-systems are deenergized and the cannon cannot be moved in elevation or azimuth while in this mode.

2-16. External Mode. Can be used against aerial or ground targets. This mode requires two operators, a gunner to operate the cannon and a range setter to operate an external range control unit. The range setter estimates target range, correspondingly sets a dial on the external range control, and depresses a pushbutton switch. This energizes the ready-to-fire light on the M61 sight and advises the gunner that the target is within range.

2-17. Firing With Remote Arm-Safe Switch. The remote arm-safe switch assembly is connected, in place of the arming connector, to J2 on the firing interrupter. With the arm-safe switch connected, the cannon will not fire until the switch pushbutton is depressed and held.

2-18. Firing Rates. Two firing rates are available. The gunner selects either the HI rate (3000 shots per minute) or the LO rate (1000 shots per minute) by setting the FIRING RATE switch on the control assembly. In the HI rate, he must also select an automatic BURST LIMIT of 10, 30, 60, or 100 rounds.

FIRING — CONTINUED

2-19. Automatic Clearing. The GUN CLEAR switch on the control assembly should always be set to the AUTO position before firing. The cannon then clears itself automatically after every firing cycle. Refer to "Precautions When Firing", (page 2-56), for additional information on clearing the cannon.

WARNING



If cannon is not cleared immediately after firing, danger of a cook-off exists. Keep cannon aimed at the target area until cannon has been cleared. Refer to COOK-OFF (page 2-56).



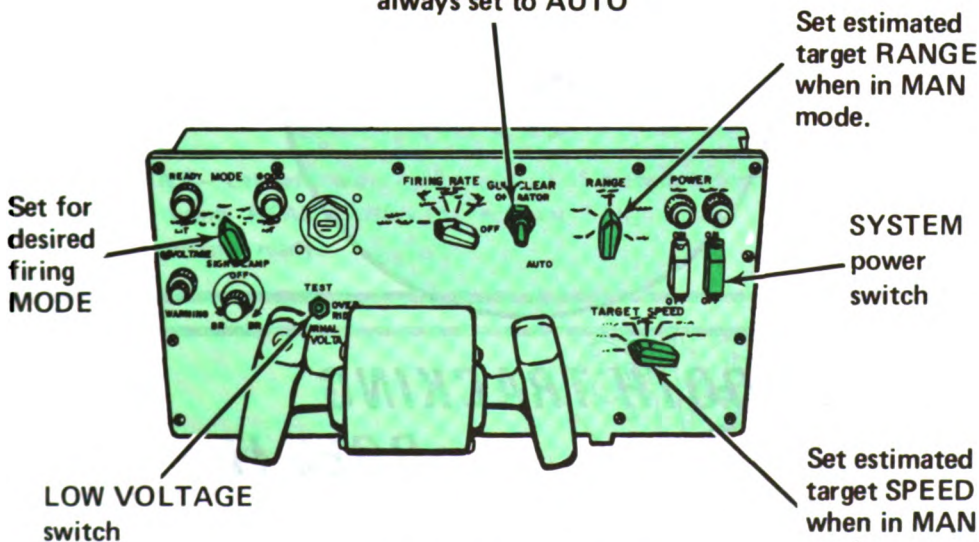
WARNING



During a firing cycle, if the ammunition does not fire normally (hang fire condition), firing operations shall be terminated immediately. Personnel will take cover until cannon has been cleared and defective ammunition disposed of. Refer to HANG-FIRE (page 2-56).



Before firing,
always set to AUTO

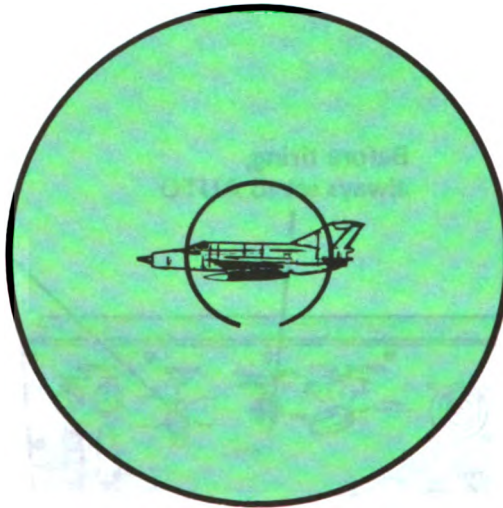


CONTROL ASSEMBLY

FIRING — CONTINUED**MARKSMANSHIP**

2-20. Your M61 lead computing sight and the AN/VPS-2 radar automatically compute the correct lead angle required to hit an aerial target. However, you must also do your part. The key to good marksmanship is smooth tracking after the target is centered in the inner sight reticle, and waiting for a recommended interval before pressing the trigger button.

2-21. There is a tendency to fire as soon as the sight picture is perfect. This will work in rifle or pistol shooting — **IT WILL NOT WORK** with your Vulcan system. After the ready-to-fire light comes on, you must smoothly track for a short interval until the sight settles to the correct lead angle. Then with the target stationary inside the inner reticle, press the trigger button and fire. Be careful not to disrupt your smooth tracking as you press the trigger button. Continue to track smoothly, during and after firing, keeping the target inside the inner reticle. If you do not wait that short interval or, if tracking is not smooth, you will miss. The length of the applicable interval you must wait is given in the specific firing instructions for RADAR and MANUAL modes of firing. Get into the habit of counting off these intervals (1001, 1002, etc.) before firing.



***SMOOTH TRACKING
DOES IT.***

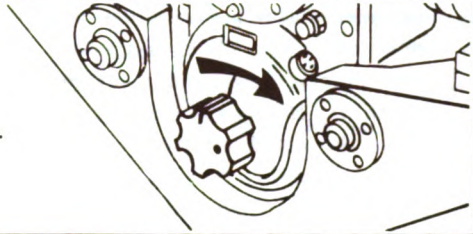
FIRING – CONTINUED

RADAR MODE

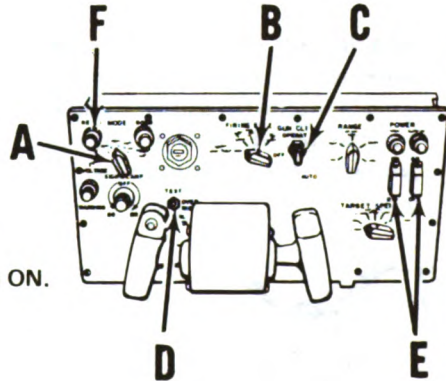
- 1** Do your
PREPARATION FOR FIRING
(page 2-39).

- 2** Set distribution box NORM-
STATIC-TEST switch to
NORM.

- 3** Check that sight is caged by rotating
the CAGED knob clockwise to its stop.

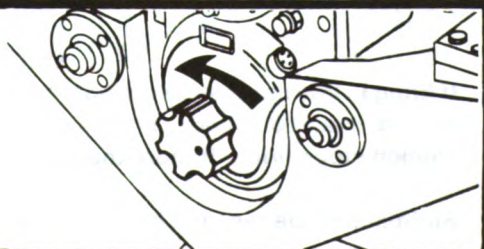


- 4**
- Set MODE select switch (A) to RADAR.
- Set FIRING RATE switch (B) to desired
HI-BURST LIMIT (high rate).
- Set GUN CLEAR switch (C) to AUTO.
- Set LOW VOLTAGE switch (D) to NORMAL.
- Set SYSTEM and GUN POWER switches (E) to ON.



IMPORTANT – Let radar warm up 2 minutes $\pm$ 15 seconds before
using. READY WHEN LIT indicator (F) lights when
radar is ready.

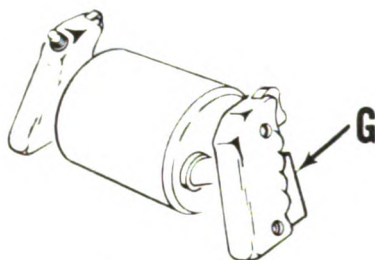
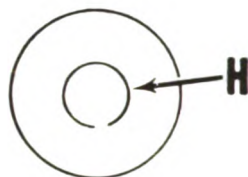
- 5**
- Turn sight CAGED knob fully counter-
clockwise to uncage sight.



FIRING - CONTINUED

RADAR MODE—Continued**6**

Press grip assembly action switch (G) and using grip assemblies, position mount so that target is in center of inner reticle (H). While continuing to track target, press and hold foot-switch (I). When radar locks on target, the mount will momentarily speed up and then return to previous tracking rate. When ready-to-fire light on sight comes on, track target smoothly for at least one second before pressing trigger to begin firing.



IMPORTANT - If ready-to-fire indicator blinks rapidly, the radar is being jammed. Release footswitch and set control assembly MODE switch to MAN and proceed to fire in manual mode (page 2-63).

**WARNING**

Observe warnings and know procedures on cookoffs, hangfires, stoppages, and low voltage (page 2-56).

**CAUTION**

If firing in low rate, release trigger to stop firing. Do not attempt to fire a burst of less than 10 rounds. If firing in high rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

Sight should be recaged before SYSTEM POWER is turned OFF.

FIRING - CONTINUED

MANUAL MODE

1

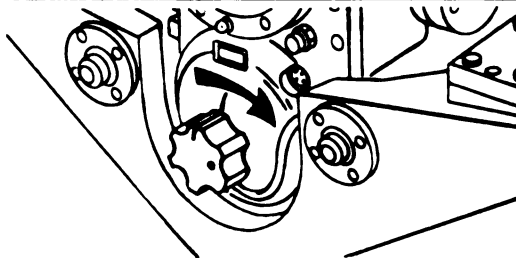
Do your
PREPARATION FOR FIRING
(page 2-39).

2

Set distribution box **NORM-STATIC-TEST** switch to **NORM**.

3

Check that sight is caged by rotating the **CAGED** knob clockwise to its stop.



4

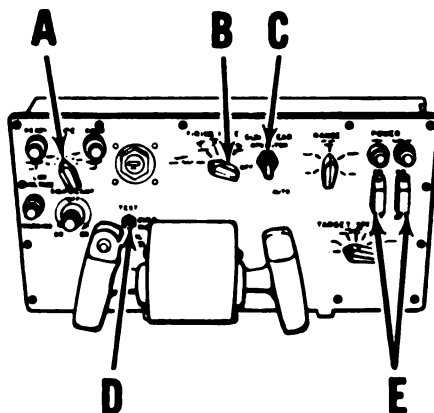
Set **MODE** select switch (A) to **MAN**.

Set **FIRING RATE** switch (B) to desired **HI-BURST LIMIT** (high rate) or **LO-NO BURST LIMIT** (low rate).

Set **GUN CLEAR** switch (C) to **AUTO**.

Set **LOW VOLTAGE** switch (D) to **NORMAL**.

Set **SYSTEM** and **GUN POWER** switches (E) to **ON**.

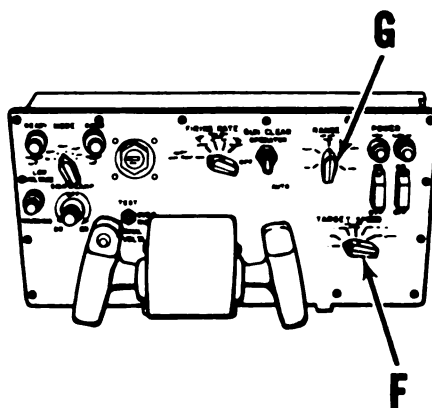


5

When target is observed:

Set **TARGET SPEED** switch (F) to estimated target speed.

Set **RANGE** switch (G) to estimated range of target.



FIRING - CONTINUED

MANUAL MODE - Continued

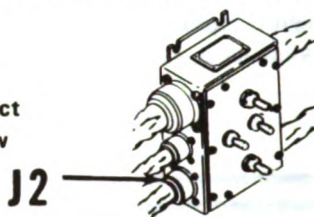
6

Turn sight CAGED knob fully counter-clockwise to uncage sight.



NOTE: In manual mode, the ready-to-fire indicator on the sight remains lit as long as action switch is depressed.

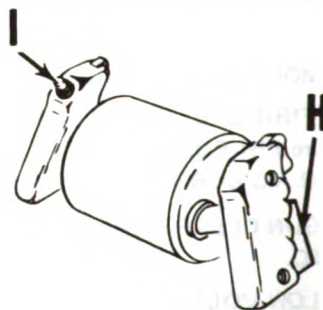
IMPORTANT - If the radar antenna does not follow the cannon, disconnect cable connector W7P2 from stow control J2.



7

Press either grip assembly action switch (H) and hold sight cage button (I) with left thumb. Position mount so that target is in center of inner reticle. With target in center of inner reticle (J), release sight cage button (I) and start tracking smoothly.

When target is centered in reticle, begin firing.

**WARNING**

Observe warnings and know procedures on cookoffs, hangfires, stoppages, and low voltage (page 2-56 thru 2-58).

CAUTION

If firing in low rate, release trigger to stop firing. Do not attempt to fire a burst of less than 10 rounds. If firing in high rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

Sight should be recaged before **SYSTEM POWER** is turned OFF.

FIRING - CONTINUED

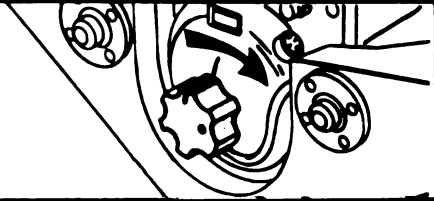
GROUND MODE (NORM)

1 Do your
PREPARATION FOR FIRING
(page 2-39).

2 Set distribution box NORM-STATIC-
TEST switch to NORM.

3

Check that sight is caged by rotating
the **CAGED** knob clockwise to its stop.



4

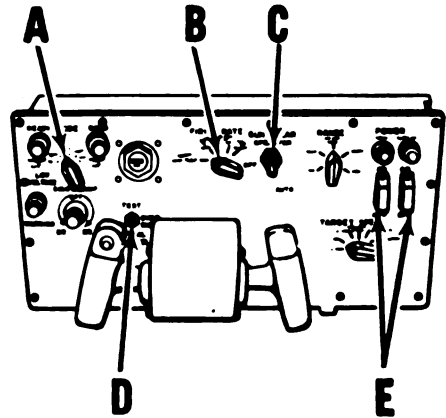
Set **MODE** select switch (A) to GRD.

Set **FIRING RATE** switch (B) to desired **HI-BURST LIMIT** (high rate) or **LO-NO BURST LIMIT** (low rate).

Set **GUN CLEAR** switch (C) to **AUTO**.

Set **LOW VOLTAGE** switch (D) to **NORMAL**.

Set **SYSTEM** and **GUN POWER** switches
(E) to **ON**.



5

Press grip assembly action switch and using grip assemblies, position cannon to
bear on target in azimuth and elevation (page 2-67) for approximate sight
picture/target size relationships. Begin firing.

6

**WARNING**

Observe warnings and know procedures on
cookoffs, hangfires, stoppages, and low
voltage (page 2-56 through 2-58).

**CAUTION**

If firing in low rate, release trigger to stop firing. Do not attempt to
fire a burst of less than 10 rounds. If firing in high rate, keep
trigger depressed until cannon stops firing. If more than one burst
is desired, depress trigger again.

Sight should be recaged before **SYSTEM POWER** is turned OFF.

END

FIRING - CONTINUED

GROUND MODE (STATIC)

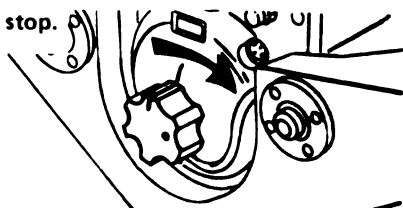
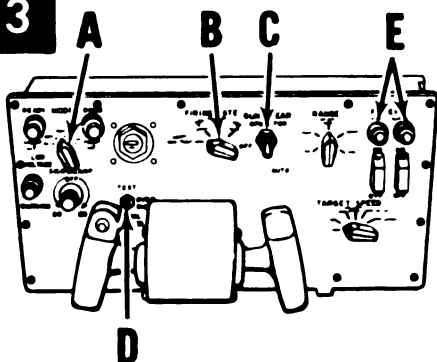
NOTE: In the ground (STATIC) mode, the servo drives are deenergized. The cannon cannot be moved in azimuth or elevation during firing.

1

Do your
PREPARATION FOR FIRING
(page 2-39).

2

Check that sight is caged by rotating the CAGED knob clockwise to its stop.

**3**

Set MODE select switch (A) to GRD.
Set FIRING RATE switch (B) to desired HI-BURST-LIMIT (high rate) or LO-NO BURST LIMIT (low rate).
Set GUN CLEAR switch (C) to AUTO.
Set LOW VOLTAGE switch (D) to **NORMAL**.
Set SYSTEM and GUN POWER switches (E) to ON.

4

Set distribution box NORM-STATIC-TEST switch to NORM. Press action switch and position cannon to bear on target in azimuth and elevation. See page 2-67 for approximate sight picture/target size relationships.

5

Set distribution box NORM-STATIC-TEST switch to **STATIC** (center position).

STATIC
TEST **NORM**

If situation permits, fire short burst to check accuracy. If burst is on target, proceed to step 6. If not on target, set distribution box NORM-STATIC-TEST switch to NORM (forward position) and repeat steps 4 and 5 to correct zero.

**WARNING**

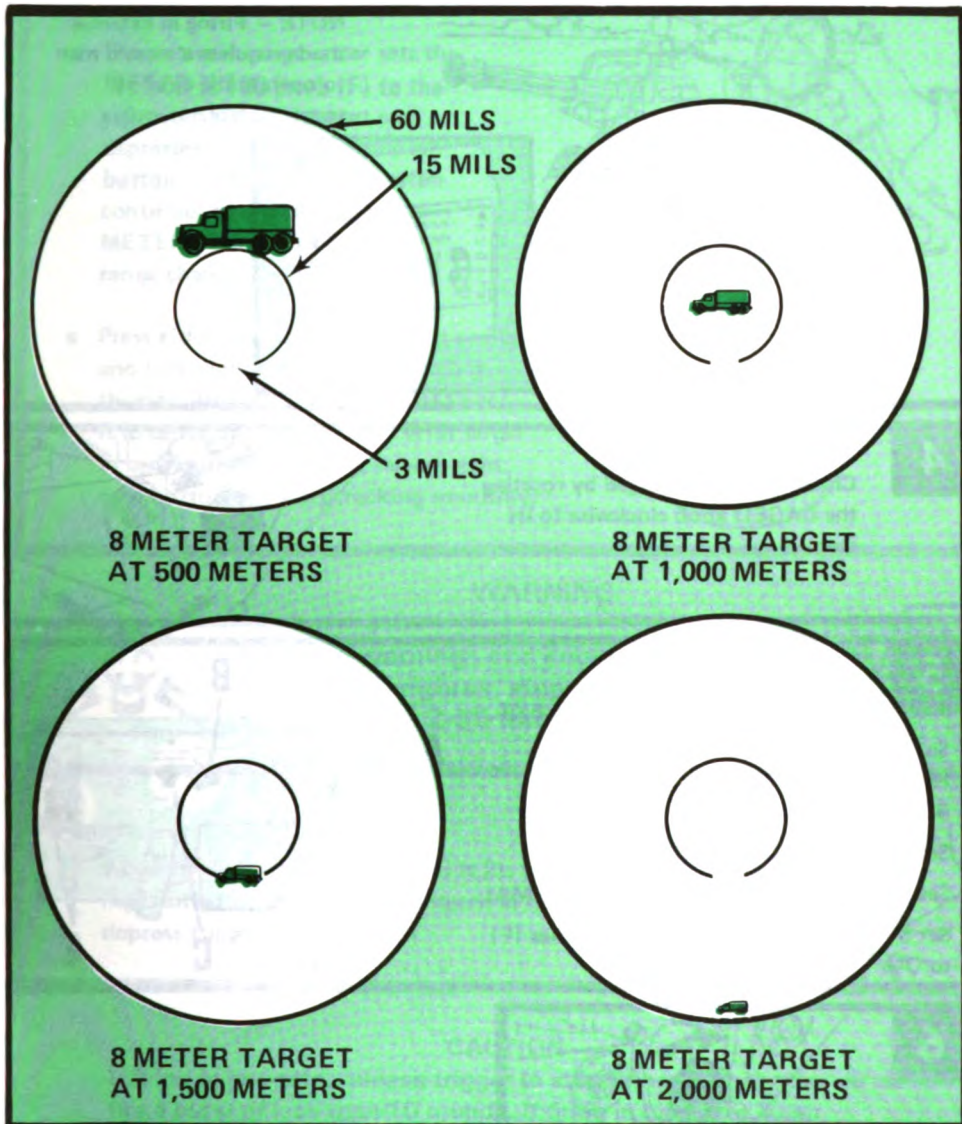
Observe warnings and know procedures on cookoffs, hang-fires, stoppages, and low voltage (page 2-56 through 2-58).

**CAUTION**

If firing in low rate, release trigger to stop firing. Do not attempt to fire a burst of less than 10 rounds. If firing in high rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

FIRING — CONTINUED**GROUND MODE (NORM & STATIC)**

The following reticle patterns are approximations of target size and sight pictures for various ranges.



FIRING – CONTINUED

EXTERNAL MODE

1

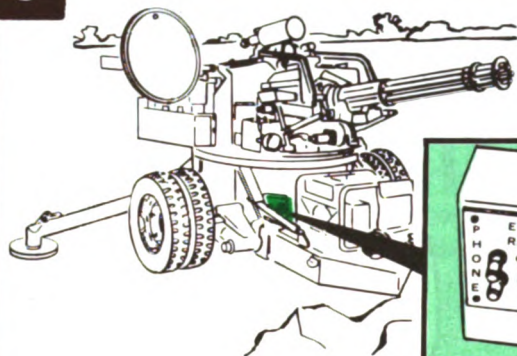
Do your
PREPARATION FOR FIRING
(page 2-39).

2

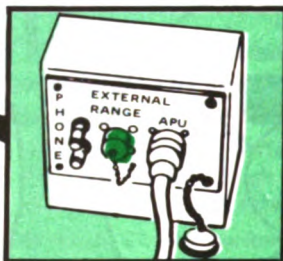
Set distribution box **NORM-
STATIC-TEST** switch to
NORM.

3

Connect external range control to **SERVICE PANEL.**



NOTE – Firing in external
mode requires a second man
to operate the external
range control.



4

Check that sight is caged by rotating
the **CAGED** knob clockwise to its
stop.



5

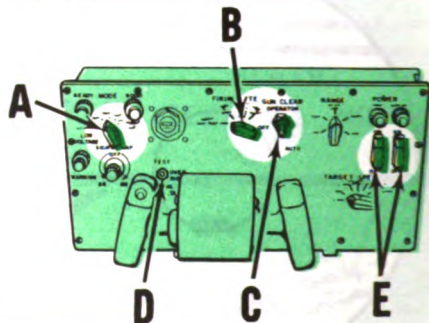
Set **MODE** select switch (A) to **EXT.**

Set **FIRING RATE** switch (B) to desired
HI-BURST LIMIT (high rate) or **LO-NO
BURST LIMIT** (low rate).

Set **GUN CLEAR** switch (C) to **AUTO.**

Set **LOW VOLTAGE** switch (D) to **NORMAL.**

Set **SYSTEM** and **GUN POWER** switches (E)
to **ON.**



6



Turn sight **CAGED** knob fully counter-
clockwise to uncage sight.

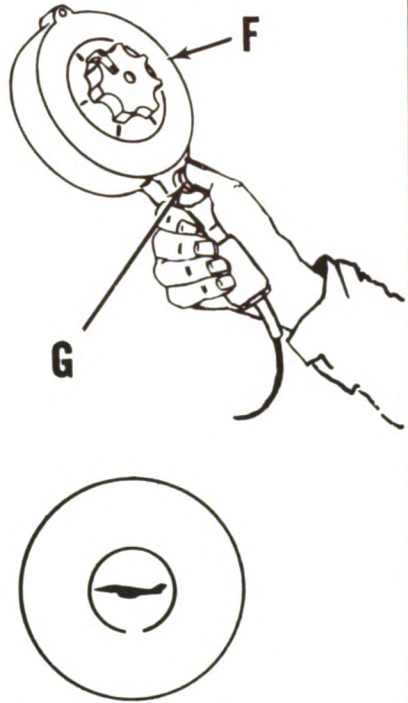
FIRING – CONTINUED

EXTERNAL MODE – Continued

7

When target is observed, two things must be accomplished at the same time.

- The external range setter sets the **METER X 100 knob (F)** to the estimated range of target and depresses the ready-to-fire push-button switch (G). Range setter continues to change setting of **METERS X 100 knob** as the range changes.
- Press either grip assembly action switch and hold sight cage button with left thumb. Position mount so that target is in center of inner reticle. With target in center of inner reticle, release sight cage button and start tracking smoothly.



WARNING



Observe warnings and know procedures on cookoffs, hangfires, stoppages, and low voltage (page 2-56 through 2-58).



8

When ready-to-fire indicator (H) is lit, tracking is smooth, and target is centered in reticle, depress trigger to fire cannon.



CAUTION

If firing in low rate, release trigger to stop firing. Do not attempt to fire a burst of less than 10 rounds. If firing in high rate, keep trigger depressed until cannon stops firing. If more than one burst is desired, depress trigger again.

Sight should be recaged before **SYSTEM POWER** is turned OFF.

END

SECTION III.

OPERATING AUXILIARY AND SUPPORT EQUIPMENT

2-22. This section contains information you need to identify, connect, protect, or operate auxiliary and support equipment used with the system.

2-23. If an equipment problem or failure occurs during normal operation, see Chapter 4 for the scoop on locating and fixing the problem.

COMMUNICATIONS EQUIPMENT

H-251/U HEADSET

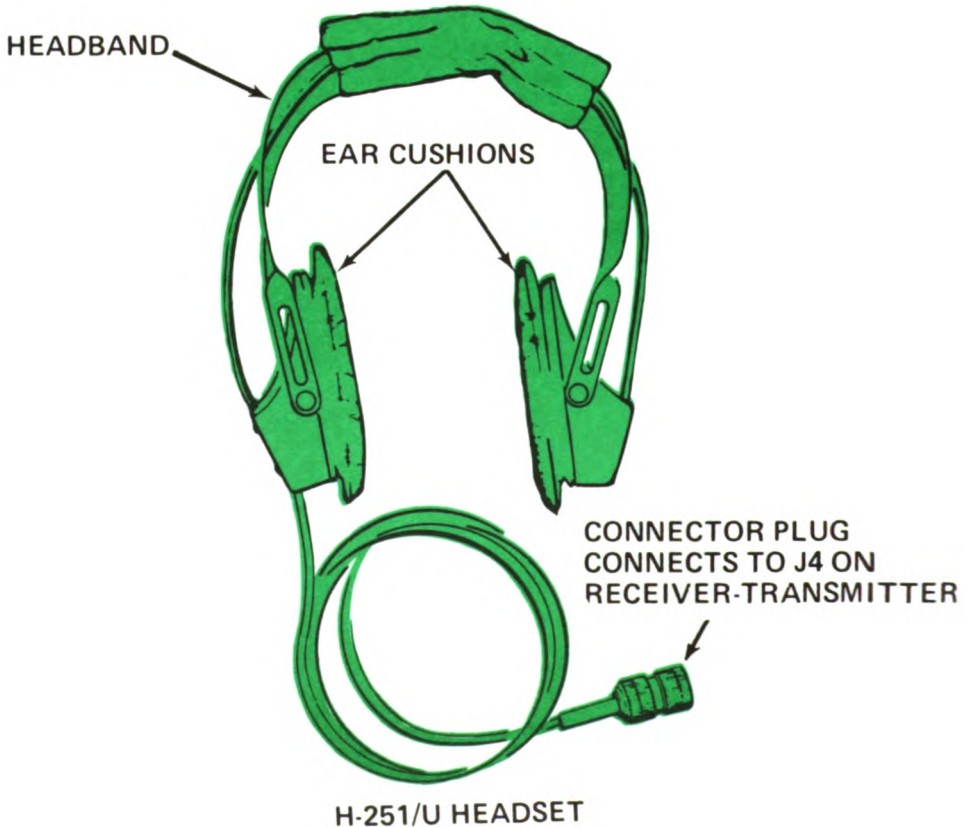
The H-251/U headset is used by operator to hear the lock-on signal from radar receiver-transmitter.

TA-312/PT TELEPHONE SET

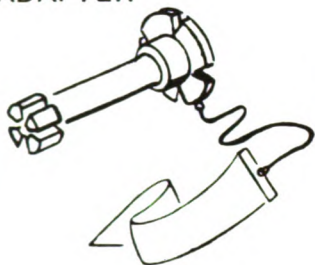
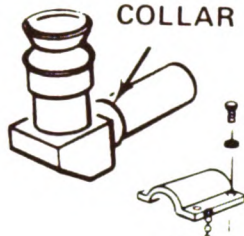
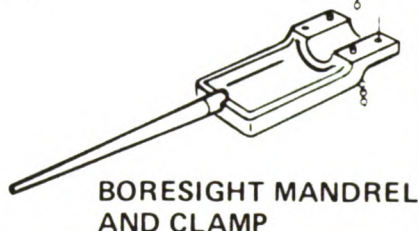
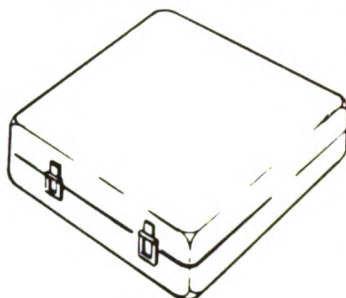
The TA-312/PT telephone set is used between the gunner and remotely located crew members.

RL-39/DR8 REEL AND HANDLE

The RL-39/DR8 reel and handle is used to carry communications wire for linking the remote phones with the gun.



BORESIGHT KIT

MUZZLE
ADAPTERM109
TELESCOPEMOVABLE
COLLARBORESIGHT
KITSOCKET HEAD
SCREW KEYSUSES

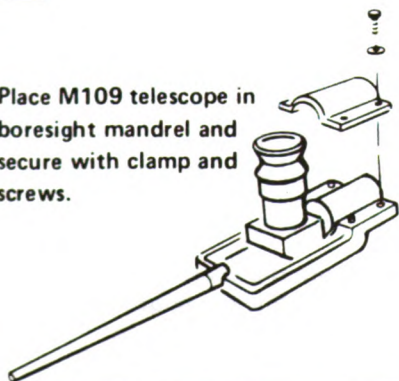
	5/64 x 1 7/8	—	Traverse adjustment locking clamp.
	3/32 x 2 3/32	—	NONE
	7/64 x 2 7/32	—	Elevation input shaft universal joint.
	1/8 x 2 11/32	—	NONE
	5/32 x 2 1/2	—	Boresight mandrel and M61 sight azimuth and elevation adjustments.

NOTE

Movable collar must be removed and stowed in boresight kit.

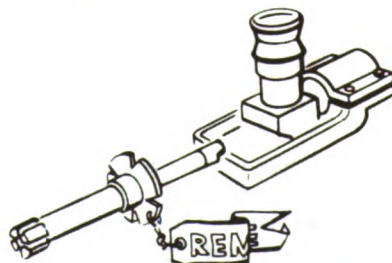
1

Place M109 telescope in boresight mandrel and secure with clamp and screws.



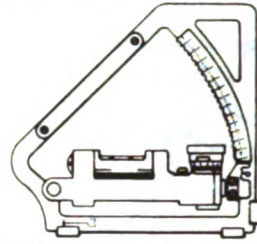
2

In use, the muzzle adapter fits into a cannon barrel, and the telescope and mandrel assembly is inserted into the muzzle adapter.



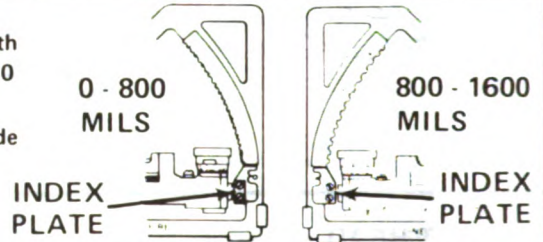
M1A1 GUNNER'S QUADRANT

The gunner's quadrant is used to measure angles of elevation in mils. To operate the quadrant a few basic features of the quadrant must be understood.



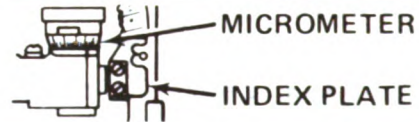
1

The coarse scale is laid out on both sides of the frame, graduated in 10 mil increments, and numbered every 50 mils. The reading is made at the index plate.



2

The fine scale is laid out on a micrometer dial, and graduated in 0.2 mil graduations from 0 to 10 mils.



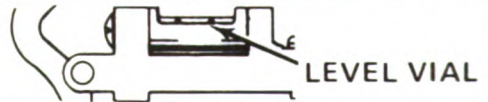
3

The LINE OF FIRE arrow must be pointed in the line of fire when making a measurement, except when measuring negative angles. For this, reverse the LINE OF FIRE arrow.



4

The level vial with bubble must indicate level before readings can be taken with the quadrant.



5

The gunner's quadrant plate must be cleaned of all dirt and foreign material before readings can be taken with the quadrant.

TO OPERATE THE GUNNER'S QUADRANT

1. Place quadrant on quadrant plate with the LINE OF FIRE arrow pointing in the line of fire. (For negative angles reverse LINE OF FIRE arrow.)
2. Release spring loaded index plate. Coarse adjust to obtain a coarse level in the level vial, then fine adjust by turning the micrometer to obtain a true level.
3. Make certain that the color is the same on both the coarse and the fine adjustment areas, then add the coarse and fine readings. The sum of the coarse and fine readings equal the mils of the angle measured. For further information refer to TM 9-1290-200-14&P.

AN/TVS-2B or AN/TVS-5 NIGHT VISION SIGHT

The AN/TVS-2B night sight is mounted to the right of the M61 sight and may be installed or removed by the crew. Detailed instructions on maintenance are contained in TM11-5855-202-13. See page 2-76.1 for operating instructions.

WARNING



A residual charge of approximately 45,000 volts exists after power is turned off. Always wait five minutes after shutdown before removing battery.

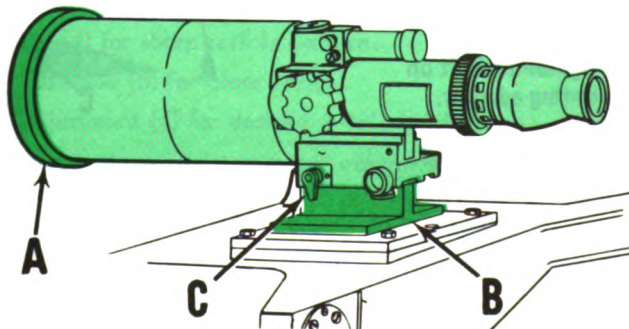


INSTALLATION

1. Open PRESSURE EQUALIZER according to instruction plate before releasing carrying case latches.
2. Open case and remove sight from case. Install battery BA-1100/U.
3. **IMPORTANT** - Do not remove adjustable lens cover (A) during daylight, and make sure aperture of cover is closed. Sunlight or other intense light can cause damage.
4. Install sight on dovetail mount (B) to right of M61 sight and push forward to stop.
5. Secure sight by tightening locking knob (C) on the left of the mounting.
6. Boresight according to page 3-37.

REMOVAL

1. **IMPORTANT** - Do not remove adjustable lens cover (A) during daylight, and make sure aperture of cover is closed. Sunlight or other intense light can cause damage.
2. Unlock knob (C) and remove sight from dovetail mount (B).
3. **IMPORTANT** - Make sure that both sight and sight case are completely dry before storing sight in case.
4. Remove battery and stow in case. Place sight in case. Close and latch cover.



AN/TVS-2B or AN/TVS-5 NIGHT VISION SIGHT-CONTINUED

The AN/TVS-5 night sight is mounted to the right of the M61 sight and may be installed or removed by the crew. Detailed instructions on maintenance are contained in TM11-5855-214-10. See page 2-76.1 for operating instructions.

WARNING

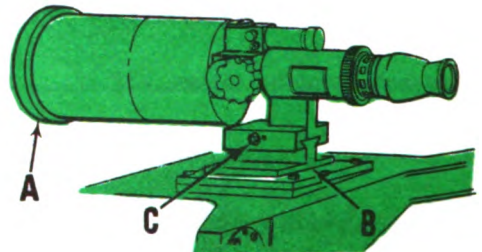
A residual charge of approximately 45,000 volts exists after power is turned off. Always wait five minutes after shutdown before removing battery.

**INSTALLATION**

1. Open PRESSURE EQUALIZER according to instruction plate before releasing carrying case latches.
2. Open case and remove sight from case. Install battery BA 1567/U.
3. **IMPORTANT** – Do not remove adjustable lens cover (A) during daylight, and make sure aperture of cover is closed. Sunlight or other intense light can cause damage.
4. Remove existing mount from AN/TVS-5 Sight and stow in case.
5. Install Mounting Adapter, P/N 12011766, on AN/TVS-5 Sight with the two screws removed from original mount as shown in figure.
6. Loosen bolt on side of mounting adapter and install sight on dovetail mount (B) to right of M61 Sight and push forward to stop.
7. Secure sight by tightening bolt on right side of mounting adapter.
8. Boresight according to page 3-37.

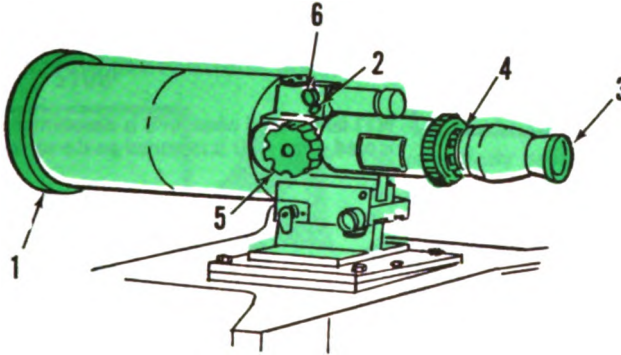
REMOVAL

1. **IMPORTANT** – Do not remove adjustable lens cover (A) during daylight, and make sure aperture of cover is closed. Sunlight or other intense light can cause damage.
2. Loosen bolt (C) and remove sight from dovetail mount (B).
3. **IMPORTANT** – Make sure that both sight and sight case are completely dry before storing sight in case.
4. Remove battery and stow in case. Place sight in case. Close and latch cover.



AN/TVS-2B or AN/TVS 5 NIGHT VISION SIGHT

The night sight is mounted to the right of the M61 sight and may be installed or removed by the crew (see page 2-75 or 2-76 for removal and installation). Instructions for operation of the night sight are listed below.



During daylight hours, turn the aperture selector on the boresight cover (1) to the darkest position. If image being viewed is not clearly visible, adjust the aperture selector to a less dark position.

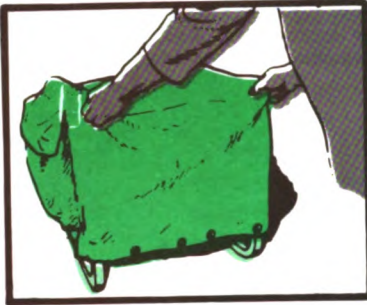
Place three position rotary control switch (2) in third (SIGHT AND RETICLE) position.



- Look through eyeshield (3) for proper image and reticle pattern.
- Adjust eyepiece focus ring (4) for sharp reticle pattern.
- Adjust objective lens focus knob (5) for clear image.
- Adjust reticle intensity adjustment (6) for desired reticle brightness.
- Turn off equipment by placing three position rotary control switch (2) to first (OFF) position.

AUXILIARY POWER UNIT (APU)

SETTING UP THE APU



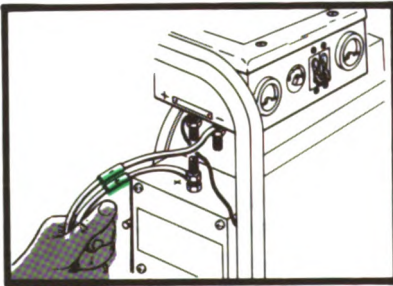
Remove APU cover and stow.
Make sure APU OFF-RUN switch
is in OFF position.

NOTE

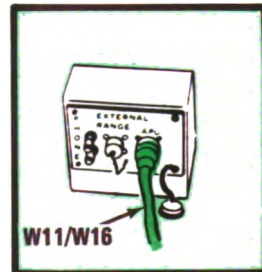
W11 lead is used when APU is dismantled from the carriage. W16
is used when APU is mounted on the carriage.

CAUTION

Make sure lead from circuit
protector to positive (+)
terminal of control box is
connected securely.
Make sure that W11 or W16 cable
lead marked negative (-) is connected
to the negative terminal on DC
control box and that cable lead
marked positive (+) is con-
nected to terminal on circuit
protector box.



Connect APU power
cable (W11 or W16) to
service panel on
carriage.



AUXILIARY POWER UNIT (APU) - CONTINUED

OPERATING THE APU

WARNING



Do not operate APU until you are familiar with operating procedures in TM 5-6115-323-14. The APU produces ample electrical power to cause injury and pain if normal safety precautions are not observed.

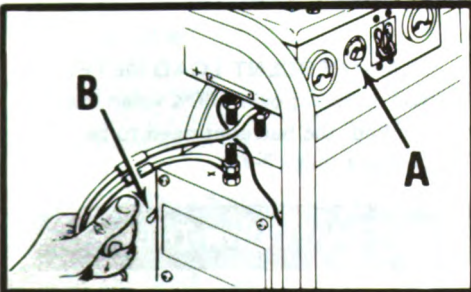
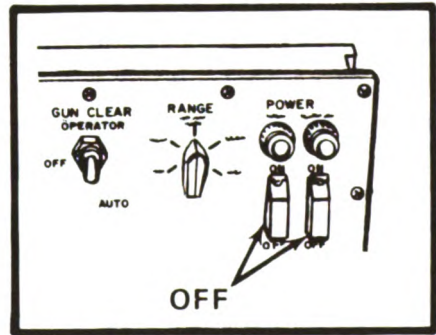


4

Do your daily preventive maintenance checks and services (PMCS). See TM stowed in APU cover pocket.

SYSTEM POWER and GUN POWER switches on control panel set to OFF position.

5



6

Set APU variable resistor knob (A) to vertical. Ensure circuit protector ON-OFF switch (B) is OFF.

WARNING



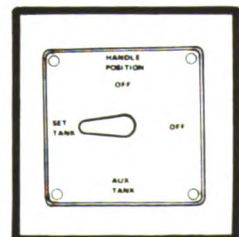
Do not fill fuel tank while APU is running. Also, make metal to metal contact between container and fuel tank when filling.



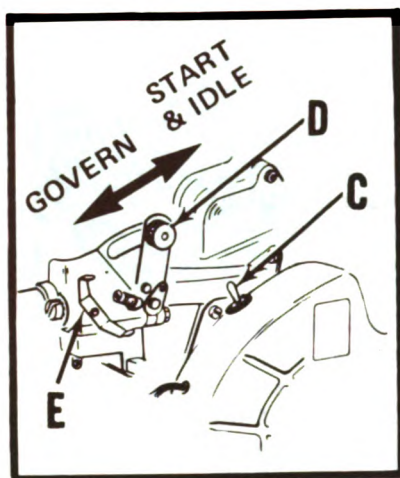
Set fuel valve handle to OFF. Fill tank with fuel.
Set fuel valve handle to SET TANK.

NOTE: AUX TANK position is used only if external fuel tank is connected.

7

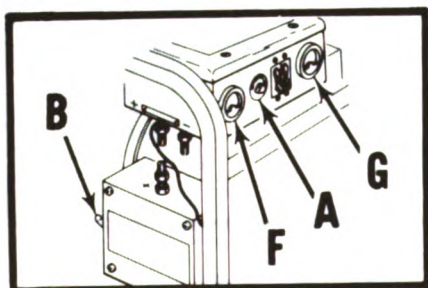


AUXILIARY POWER UNIT (APU) - CONTINUED



CAUTION

Never allow DC volts meter (F) to indicate over 28.7 volts.



CAUTION

If circuit protector ON-OFF switch (B) trips for an unknown reason, it will reset by itself. If it trips again, notify organizational maintenance.

Set carburetor control (D) to START & IDLE.

Set OFF-RUN switch (C) to RUN.
Set carburetor control (D) to START & IDLE.
Set choke lever (E) to CHOKE (if engine is cold).
Crank engine with starter rope and move choke lever (E) to off when engine starts. Don't overchoke.
Move carburetor control (D) to GOVERN and lock after engine starts.

NOTE

Don't adjust or apply load until engine runs smoothly with control set at GOVERN.

Set circuit protector ON-OFF switch (B) to ON. Adjust variable resistor knob (A) until DC VOLTS meter (F) indicates 27.5-28.7 volts.

If APU PERCENT LOAD METER (G) indicates over 100% when load is applied, the batteries need to be charged (page 3-73).

SHUTTING DOWN THE APU

Set circuit protector ON-OFF switch (B) to OFF.

Set OFF-RUN switch (C) to OFF.

For further information refer to TM 5-6115-323-14.

TARGET ALERT DATA DISPLAY SET (TADDS)

2-23.1. General. The purpose of the TADDS is to receive and display target intelligence information from the radar set data link transmitter for use by air defense weapon emplacements. The TADDS also allows its operator to listen to voice commands from the radar set operator.

RADAR SYSTEM RELATIONSHIP

The TADDS works together with the radar set to accomplish its mission. The Forward Area Alerting Radar (FAAR) System acquires and identifies aircraft contacts within its range and altitude limits. The target data is shown on the radar set PPI display that has a grid pattern similar to that of the TADDS. Grid coordinate location data and status data of aircraft are transmitted to the TADDS by the radar set operator using the radio frequency data link (RFDL) transmitter. This information is received by the TADDS and presented on the data display matrix centered on the position of the radar set. The TADDS operator determines the relative position of targets with respect to his site by orienting the TADDS with magnetic north and by correlating his geographic location with the coordinates of his display.

The TADDS includes FM receiver A5, a data link processor and display group, and battery set A7. These are housed in a fiberglass case with handle and hinged cover.

A relief valve equalizes the pressure differential that may develop between the inside and outside of the case because of changes in altitude or temperature.

The cover contains map storage clamps, a magnetic compass, a telescoping antenna, an antenna adapter, a battery charging cable, a marking pencil, an antenna tuning chart, and an interlock striker plate. The interlock turns the display set power off when the cover is closed. The antenna ground plane is connected to the FM receiver and coiled around the clamps in the cover.

FM RECEIVER

The receiver receives frequency-modulated (FM) transmissions and contains a frequency synthesizer. It receives target data or voice transmissions from the radar set in the frequency band of 30.00 to 75.95 megahertz (MHz).

A speaker is incorporated in the FM receiver. This allows the operator to hear data tone bursts or voice transmissions which will aid him in evaluating message quality, relative signal strength, radio frequency interference (RFI), and electronic countermeasures (ECM). The speaker also reproduces an audible alarm tone at 1500 Hz to alert the operator whenever the data link signals are absent or incorrect, or new data is received.

The front panel controls include: four frequency selection switches, and a volume control which turns on power, adjusts the audio level of the data tone bursts or voice transmissions, and provides squelch control. The front panel is also provided with a connector for the telescoping antenna and adapter.

DATA LINK PROCESSOR AND DISPLAY GROUP

The data link processor and display group includes four printed circuit cards (A1-A4) and the data display matrix (A6).

TARGET ALERT DATA DISPLAY SET (TADDS) - Continued

The printed circuit cards are inserted in a connector mounting frame and are not accessible to the operator or organizational maintenance technician.

The data display matrix consists of 49 indicator groups. Within each indicator group there are two indicator discs that are electro-magnetically actuated. One disc is fluorescent orange on one side, denoting a foe and black on the other side, denoting no indication. The other disc is fluorescent green on one side, denoting a friend, and black on the other side. The data display matrix has a transparent plastic window. This window is engraved with a 7 by 7 grid that separates the 49 indicator groups. The operator can mark information showing the location and orientation of the air defense weapon emplacement and aircraft on the window with the marking pencil.

BATTERY SET

The battery set is composed of a rechargeable, nickelcadmium battery, and an attached cable and connector. The assembly is contained in a separate compartment of the TADDS case accessible from the underside of the case.

TADDS OPERATOR CHECKS AND ADJUSTMENTS

Note

If any of these checks can not be successfully completed, notify organizational maintenance.

BATTERY VOLTAGE CHECK

This check is done before operation and periodically when TADDS is in storage. If battery failure occurs during operation, use the battery charging cable (4) to hook up to an external 24 vdc supply.

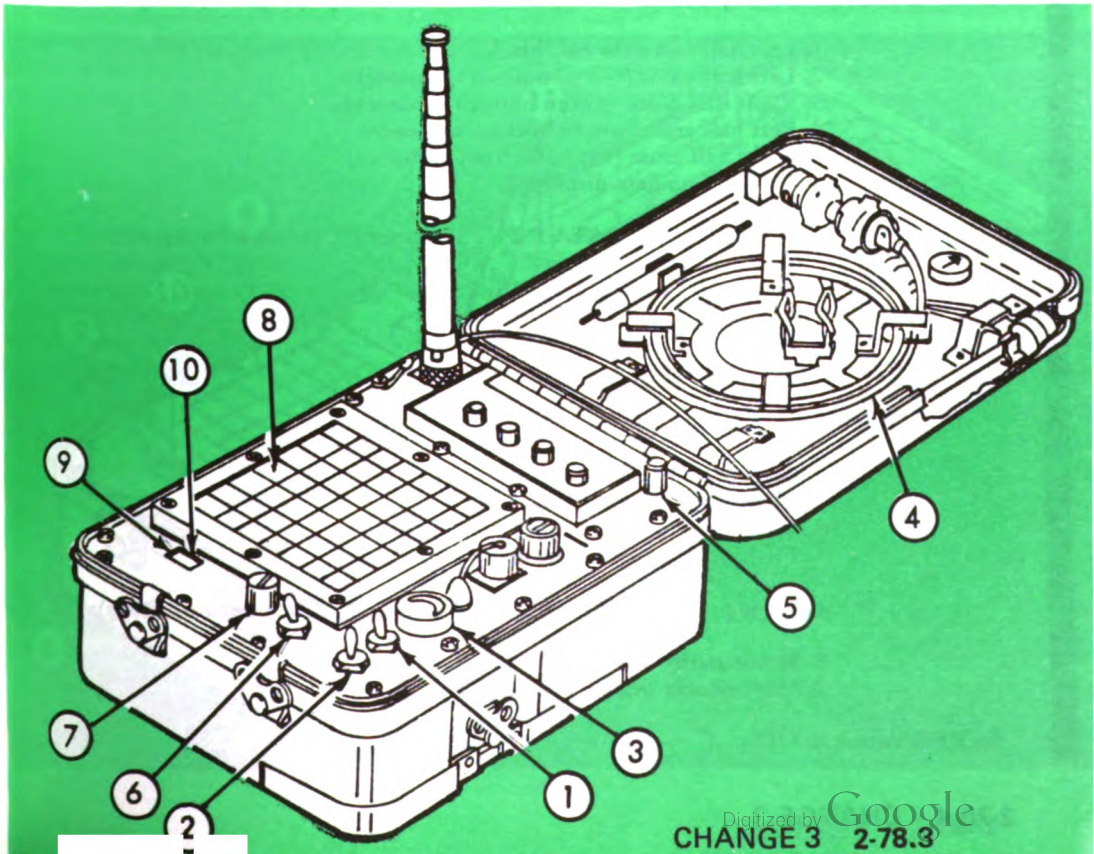
- 1 Set PWR switch (1) to ON.
- 2 Set and hold switch (2) to BAT AND RESET.
- 3 SIG AND BAT meter (3) should indicate between 0.5 and 0.7.

0.7 means battery is fully charged.

0.63 means you should perform the battery voltage check **periodically** during operation.

0.59 means no more than two hours of operating time remaining.

Less than 0.59 means battery should be recharged or replaced.



DATA LINK PROCESSOR AND DISPLAY GROUP SELF TEST CHECK

This test verifies the operational readiness of the TADDS excluding the receiving capability of the FM receiver. Signals are generated by the self test circuitry instead of the FM receiver. These signals are sequenced and fed to the normal operating circuitry.

1. To prepare for test, position switches and controls as follows:

PWR (1) to OFF.
VOL (5) fully clockwise (squench off).
AUDIO ALARM (6) to READY.
AUDIO ALARM VOL (7) fully clockwise (cw).

2. Set PWR switch to ON. Hissing noise should be heard from speaker.

Note

If a message is being transmitted on the frequency to which the TADDS receiver is tuned, a tone burst will be heard.

3. Set BAT. AND RESET/SELF TEST switch (2) to SELF TEST position and release.
4. Observe the response to the TADDS indicators. Repeat step 3 as often as required to verify the normal indications listed below. The following sequence of indications should be observed. Indicators should shift without sticking.

A. Color sequence of friend/foe indicators in display matrix (8):

1. Left half and right half black.
2. Left half color (top to bottom sequence).
3. Right half color (top to bottom sequence).
4. Left half erase (top to bottom sequence).
5. Right half erase (top to bottom sequence).
6. Left half no data displayed.

B. Color sequence of DATA INPUT indicator (9) (black between steps):

1. Momentarily green before A. 2.
2. Momentarily green following A. 2.
3. Momentarily green following A. 4.
4. Continuously green following A. 6.

C. Audio alarm sequence:

1. Two alarm beeps before A. 2.
2. Third alarm beeps before A. 3.
3. Fourth alarm beeps before A. 5.
4. Fifth alarm beeps before A. 6.

D. Color sequence of NEW DATA indicator (10) (black between steps):

1. Momentarily orange before A. 3.
2. Momentarily orange before A. 5.

Set PWR switch to OFF.

TADDS OPERATOR CHECKS AND ADJUSTMENTS - Continued

Note

If PWR switch is not set to the off position promptly, an audio alarm will sound within 2 seconds after completion of test sequence.

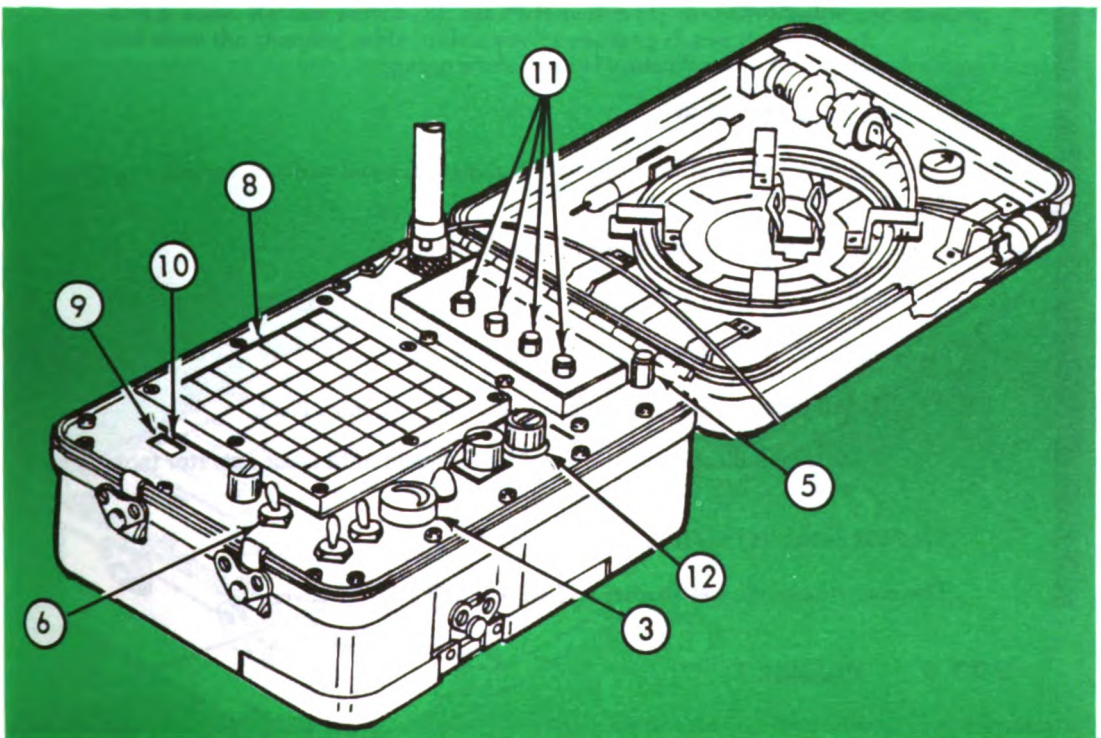
TADDS/RADAR OPERATIONAL CHECKS

In this check, a repetitive test sequence of four data words is transmitted to the TADDS over the RF data link. The purpose of this check is to verify the operation of the TADDS receiver and to insure that the TADDS can process new data.

1. To prepare for test emplace TADDS and position switches and controls as follows:

FREQUENCY MH2 switches (11) set to designated frequency.
 ADDRESS CODE switch (12) to position corresponding to code in effect.
 ALARM switch (6) to READY.
 VOL control (5) to mid-range.

2. Set PWR switch to ON.
3. Using the intrasite communications link, request the radar operator to set the RFDL XMIT MODE switch to TEST. SIG AND BAT. meter (3) indicates a reading 0.3 to full scale.
4. Request the radar operator provide a voice check. You should get clear voice reception with good volume control.



TADDS OPERATOR CHECKS AND ADJUSTMENTS - Continued

- 5 Observe the following sequence of events. This sequence will repeat itself approximately every 6 seconds for as long as the **RFDL XMIT MODE** switch is in the **TEST** position.

Note

Steps F, and K, will occur only if the BAT AND RESET/SELF TEST switch is momentarily placed in the BAT AND RESET position. This must be done within 1.5 seconds after the alarm sounds.

- A. RFDL tone burst will be heard and will recur every 1.5 seconds.
 - B. DATA INPUT indicator (9) will show green.
 - C. All green indicators in left half of matrix (8) will show; all orange indicators will show.
 - D. NEW DATA indicator (10) will show orange.
 - E. Audio alarm will sound.
 - F. NEW DATA indicator (10) will show black and audio alarm will stop (see note above).
 - G. DATA INPUT indicator (9) will show black.
 - H. All green indicators in right half of matrix will show; all orange indicators will show.
 - I. NEW DATA indicator (10) will show orange.
 - J. Audio alarm will sound.
 - K. NEW DATA indicator (10) will show black and audio alarm will stop (see note above).
 - L. DATA INPUT indicator (9) will show green.
 - M. All indicators in left half of matrix (8) will show black.
 - N. DATA INPUT indicator (9) will show black.
 - O. All indicators in right half of matrix (8) will show black.
 - P. Normal indicators A. through L. will repeat until radar operator terminates test.
- 6 Set PWR switch (1) to OFF.
 - 7 Disconnect antenna and adapter and store in the TADDS cover.

TADDS OPERATOR CONTROLS AND ADJUSTMENTS- Continued

BATTERY CHARGING CIRCUIT CHECK

This test is done before charging the battery. It is done to make sure the battery charging circuit is functioning correctly.

1. Set PWR switch (1) to OFF.
2. Open battery compartment cover and remove battery set.
3. Remove charging cable (4) and connect to 24 VDC connector (13).

CAUTION

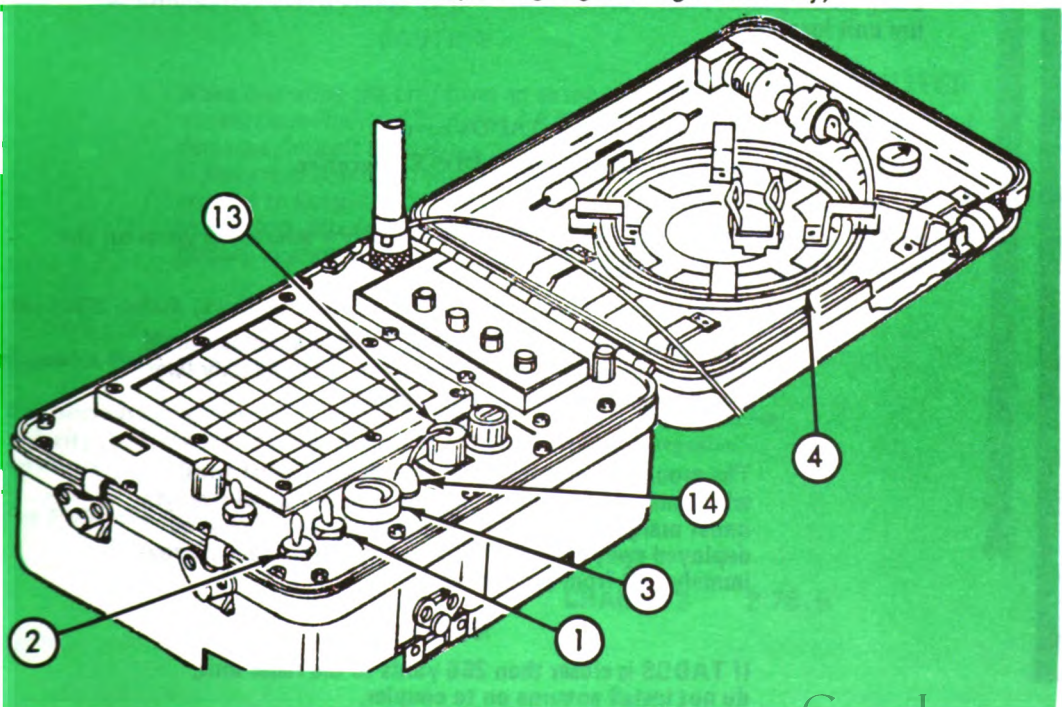
Don't connect cable unless PWR switch is off.

4. Connect charging cable alligator clips to any 24 vdc source. Observe polarity, red sleeve to positive terminal and black sleeve to negative terminal. CHARGE LIGHT indicator (14) should light.
5. Set PWR switch (1) to ON.
6. Set and hold switch (2) to BAT AND RESET. SIG AND BAT meter (3) should read above 8 volts.

Note

In most cases the meter will peg to 12 volts.

7. Test is done. Release switch (2). Set PWR switch (1) to OFF. Disconnect, remove, and store the charging cable (unless you're going to charge the battery).



TADDS OPERATING PROCEDURES

For best receiving conditions, select a site for the TADDS which allows a clear line-of-sight to the radar unit. You usually won't be able to do this. But at least try to pick a site with no nearby obstructions to the imagined line-of-sight. Keep away from interference such as generators or transmitters. Emplace TADDS while listening to speaker noises with receiver volume turned fully clockwise and pick a site where reception is best. If it is necessary to increase sensitivity, use the antenna ground plane.

CAUTION

Do not emplace the TADDS within 30 feet of any antenna capable of radiating 75 watts as the FM receiver may be damaged. For antennas capable of radiating more than 75 watts increase the distance.

ORIENTATION OF TADDS

1. Using weapon system compass, rotate compass until arrow aligns with north line marking on compass dial.
2. Rotate TADDS so that longitudinal axis points in magnetic north-south direction with top of data display matrix at north.

NOTE

Make certain compass is not influenced by nearby magnetic metallic objects.

3. Using grease pencil, place a mark in the center display square to signify the radar's location.
4. Using grease pencil, place a mark on the display square which corresponds to fire unit location.

ANTENNA INSTALLATION

1. Remove antenna and coupler from TADDS cover.
2. Attach coupler to ANT connector on TADDS FM receiver.
3. Screw antenna into the coupler.
4. Extend antenna sections to correspond to the frequency selected as given on the antenna tuning chart located in TADDS cover.

NOTE

Use larger antenna sections first. Erected antenna should have a smooth appearance...no steps, meaning only largest and smallest sections were extended.

NOTE

The ground plane consists of four cables (radial arms) which may be needed to increase received signal strength under marginal conditions. If required, they should be deployed away from the TADDS so that they are approximately 90° from each other.

NOTE

If TADDS is closer than 260 yards to the radar unit, do not install antenna on to coupler.

TADDS OPERATING PROCEDURES – CONTINUED**OPERATING PROCEDURES**

1. Controls, indicators and connectors are shown on opposite page.
2. Because the TADDS is a passive device used to display tactical information, no detailed operating instructions are provided in this manual...Refer to FM 44-6 and TM 9-1430-589-12.
3. Observe following cautions:

CAUTION

Take care of the battery...no sustained operation above 122°F or below -40°F...when TADDS has been operated from an external power source, extend battery charge time next time battery is charged. Don't charge the battery with temperatures either above 122° or below 32° F.

If operating the TADDS within 260 yards of the radar set, reduce the input to the FM receiver by either detuning or removing antenna.

Do not operate the TADDS within 30-foot distance of transmitters operating at 75 watts power output. Increase the separation for transmitters with power outputs greater than 75 watts.

EMERGENCY OPERATION WITH BATTERY FAILURE

If TADDS battery fails to provide adequate voltage the TADDS can be maintained operational by using an external 24 V battery as a voltage source. Proceed as follows:

CAUTION

When operating the unit from an external source at temperatures below 32° F, the TADDS battery may be damaged. Inspect the battery after this type of operation. If there is moisture on the battery jacket or the jacket appears to bulge this is an indication that electrolyte has leaked from the cells. Replace the battery and clean the battery compartment.

1. Set PWR switch (1) to OFF.
2. Connect battery charging cable (4) to connector (13).
3. Connect charging cable alligator clips to external 24 vdc source. Observe polarity, red sleeve to positive terminal and black sleeve to negative terminal.
4. Set PWR switch (1) to ON.

CHANGE 3 2-78.9

TADDS OPERATING PROCEDURES - CONTINUED

FREQUENCY-MHz SWITCH

Frequency selection is controlled by four switches, keys 1, 2, 3, and 4, (tens, units, tenths and hundredth digits) of the receiver frequency in MHz. Frequency range is 30.00 through 75.95 MHz. Mechanical stops prevent settings outside this range.

COMPASS

Used to orient display set to magnetic North

Power interlock
Sets PWR switch to OFF when cover is closed

Data display Matrix
Indicates aircraft location and friend or foe status

NEW DATA indicator
Alerts operator when new data is received

ANT Connector A5J1

VOL CONTROL
Controls volume and sets squelch

ADDRESS CODE switch
Selects address code

24 VDC connector J1
For battery charging cable

CHARGE LIGHT indicator
Lights when battery is being charged

DATA INPUT indicator
Informs operator of reception and processing of the RFDL message

SIG AND BAT meter
Indicates signal strength of received data or battery voltage

AUDIO ALARM VOL control
Adjust volume of alarm

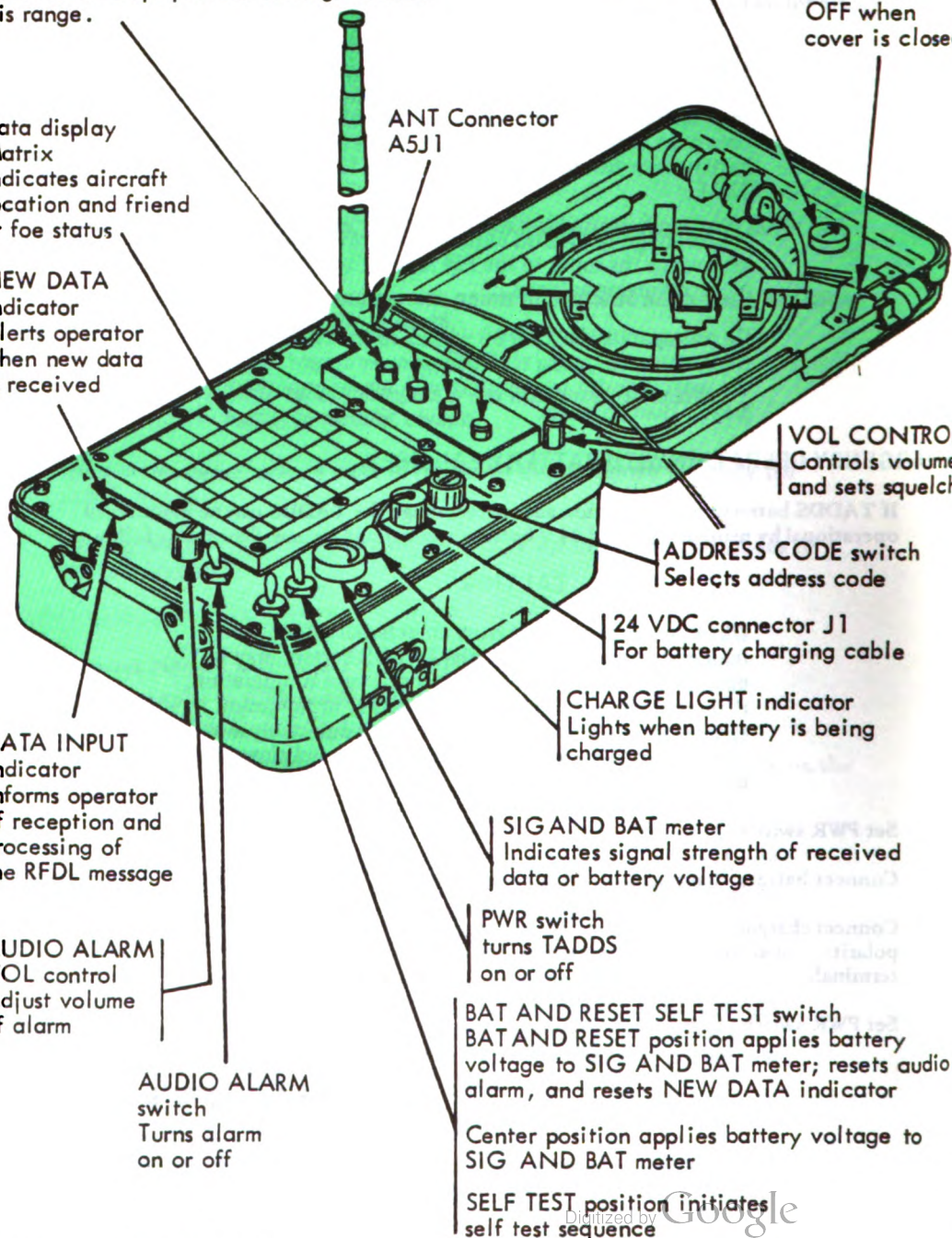
PWR switch
turns TADDS on or off

AUDIO ALARM switch
Turns alarm on or off

BAT AND RESET SELF TEST switch
BAT AND RESET position applies battery voltage to SIG AND BAT meter; resets audio alarm, and resets NEW DATA indicator

Center position applies battery voltage to SIG AND BAT meter

SELF TEST position initiates self test sequence



Section IV.

OPERATING UNDER UNUSUAL CONDITIONS

2-24. General. When operating under unusual conditions, there are certain things to be careful of, and additional things that must be done. The DOs and DON'Ts that follow are important. They must be observed so that you and your equipment will perform properly.

OPERATING IN EXTREME COLD (0° to -65°F)

2-25. Extreme cold thickens lubricants, cracks insulation, and makes materials easier to damage. In addition to complete winterization and good maintenance, the following DOs and DON'Ts will keep your gun system operating in rugged arctic weather.

DOs AND DON'Ts IN EXTREME COLD

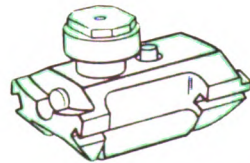
DOs

1

**DO your
Before Operation
PMCS**

2

DO – Clean and lubricate
breech bolts according
to LO 9-1005-286-13.



3

Do – notify organizational
maintenance to reposition
battery taps if necessary
(page 2-21).

4

DO – Be aware of the way
cold weather affects your
gun system.

5

DO – Cover ends of telescopes
to protect from snow and ice.

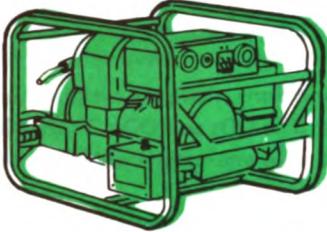
6

DO – Cover cannon when
not in use.

OPERATING IN EXTREME COLD – CONTINUED

DOs – Continued

7



DO – Make sure oil in crankcase of the APU engine has been changed to grade OES when operating below 0°F.

DO – Run APU 15 minutes before applying load to unit.

DO – Operate the APU for 1 hour to preheat batteries when the temperature is between 32°F and -40°F. The APU should be operated for 2 hours to preheat batteries when temperature is between -40°F and -65°F.

8

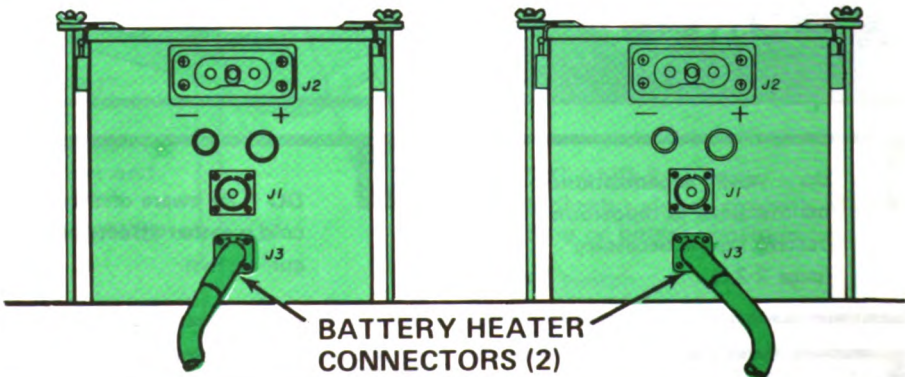
DO – Clean off all snow, ice, and mud as soon as possible after operating or after traveling.

9

DO – Allow the fire control system to warm up. Operate in standby for 15 minutes between 32°F and -40°F and for 30 minutes between -40°F and -65°F.

10

DO – Make sure battery heaters are connected. Make sure battery holdowns are tight and batteries secure.



11

DO – "After operation procedures" (PMCS)

OPERATING IN EXTREME COLD – CONTINUED

DON'Ts

1

DON'T – Touch bare metal or fuel with hands-wear gloves.

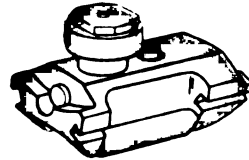
2

DON'T – Expose sight and fire control instruments to sudden temperature changes.

3

DON'T – Breathe on optical surfaces. Condensation will freeze.

4



DON'T – Over lubricate breech bolts (page 2-79).

END

OPERATING IN EXTREME HEAT

2-26. General. Rust and fungus thrive in hot-humid weather. Materials dry and crack, battery liquid and oil evaporate faster. Special care will insure dependable operation of your vehicle in extreme heat.

DOs AND DON'Ts IN EXTREME HEAT**DOs****1**

**DO your
Before Operation
PMCS**

2

DO — Make sure that breech bolt assemblies and mount bearing are lubricated according to LO 9-1005-286-13.

3

DO — Park gun under cover from sun or use tarps if shelter is not available.

4

DO — Store and operate APU in a shaded location when possible. Allow free flow of air around unit (see TM 5-6115-323-14).

5

DO — Make frequent inspections, clean and lubricate to prevent deterioration. See Lube Order.

6

DO — Protect fire control system from direct rays of sun as much as possible.

7

DO — Keep sun off ammo.

8

DO — Notify organizational maintenance to check the level of the electrolyte in the battery cells daily.

**WARNING**

DO NOT — Smoke, handle ammo, wear rings, or drop tools when checking batteries.

**DON'Ts**

DON'T — Fill APU fuel tank completely — allow for expansion of fuel.

OPERATING IN DUSTY OR SANDY AREAS

2-27. General. Blowing dust and sand will erode external finishes and affect your gun in many other ways. Sand mixed with grease and oil forms a grinding agent that will cause failure of moving parts. Dust and sand are enemies of your gun system.

DOs AND DON'Ts IN DUSTY OR SANDY AREAS

DOs

1

DO your Before Operation PMCS

2 DO — Lubricate completely to force out lubricants contaminated by sand or dust. (See LO 9-1005-286-13.)

3 DO — Park under shelter and install traveling cover when gun is not to be used for an extended period of time.

5 DO — Clean APU air cleaner and fuel filter daily. (See TM 5-6115-323-14.)

7 DO — Touch up paint damaged by blowing sand.

8 DO — Protect sight and telescopes from sand.

10 DO — Cover radar antenna when not in use.

4 DO — Make sure only a thin film of oil is on breech bolt assemblies before operating cannon.

6 DO — Use muzzle cover when cannon is not in use.



9 DO — Provide wind shield and keep area around APU free of dust and sand. Wet area down if possible. (See TM 5-6115-323-14.)

OPERATING IN DUSTY AND SANDY AREAS –CONTINUED

DON'Ts

1 **DON'T** – Drive prime mover with gun through soft, sandy, or dusty areas if you can take a hard, solid route.

2 **DON'T** – Over lubricate

END

OPERATING UNDER RAINY OR HUMID CONDITIONS

DOs AND DON'Ts UNDER RAINY OR HUMID CONDITIONS

2-28. General. Unless precautions are taken, dampness will corrode and damage equipment. This action is accelerated during rainy seasons or in humid climates. Electronic and electrical equipment can be severely affected. Driving conditions can become dangerous.

DOs

1
DO your
Before Operation
PMCS

2 **DO** – Clean mud from all parts as soon as possible after traveling. Lubricate according to LO 9-1005-286-13.

3 **DO** – Keep APU fuel tank full - prevents condensation.

4 **DO** – Keep equipment dry. Install system covers (and tarps if available) during rain. Lift, or open covers as soon as possible to allow ventilation. Check with organizational maintenance for methods of drying exposed equipment.

6 **DO** - Coat cannon barrel muzzle clamp with cleaner, lubricant (CLP, item 3, appendix D).



5 **DO** -- Remove carriage drain-plug and keep outlet clear of obstructions.

7 **DO** - Remove corrosion from metal surfaces with rag (item 26, appendix D) or abrasive paper (item 22, appendix D). Apply cleaner, lubricant (CLP, item 3, appendix D).

OPERATING UNDER RAINY OR HUMID CONDITIONS – CONTINUED

DOs CONTINUED

8 DO – Erect a shelter to protect the APU. If no shelter, cover with canvas. Remove cover during dry periods.

9 DO – Keep insects out of system. They cause shorts with bodies and damp webs.

DON'Ts

1 DON'T – Fold wet canvas. Dry out if possible.

2 DON'T – Make sharp turns in mud with prime mover.

END

**DOs AND DON'Ts
IN SALT WATER AREAS**

2-29. General. Rust thrives in salt water areas. Special care will insure dependable operation of your vehicle in salt water areas.

DOs

1
**DO your
Before Operation
PMCS**

2 DO – Make sure that breech bolt assemblies and mount bearing are lubricated according to LO 9-1005-286-13.

3 DO – Call organizational maintenance when exposure extends beyond normal crew maintenance.

DON'Ts

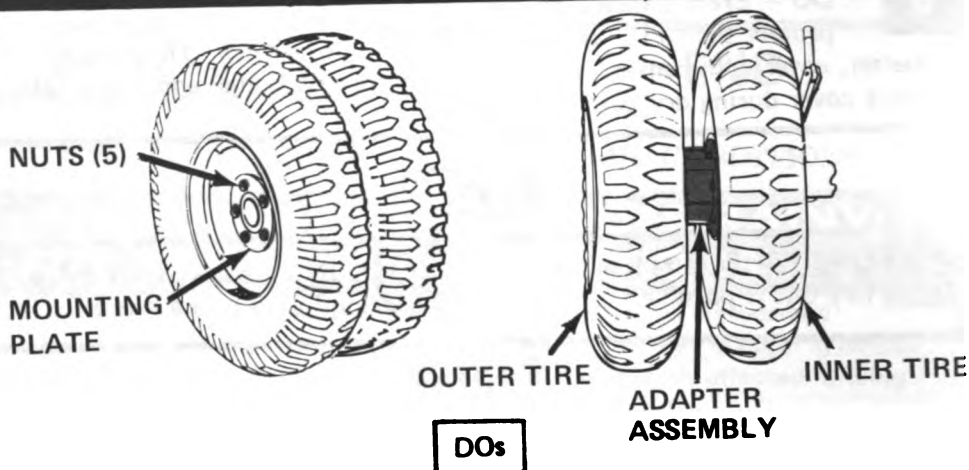
1 DON'T – Use water under pressure to wash the gun system.

2 DON'T – Allow rust to build up on your gun system.

END

OPERATION WITH ONE OR TWO FLAT TIRES

DOs AND DON'Ts FOR OPERATING WITH LESS THAN FOUR FULLY-INFLATED TIRES



1 DO your Before Operation PMCS

2 DO – Check tire pressure before operation.

3 DO – Operate on properly inflated inner tire when outer tire is flat.

4 DO – Move properly inflated outer tire to inside when inner tire is flat.

5 DO – Mount properly inflated tires on inside when operating with only two wheels. Use mounting plate and nuts to mount wheels; leave adapter assembly off.

DON'Ts

1 DON'T – Overinflate tires.

2 DON'T – Operate on hard surfaces with under-inflated tires.

3 DON'T – Operate at speed in excess of 72 Km/h (45 MPH).

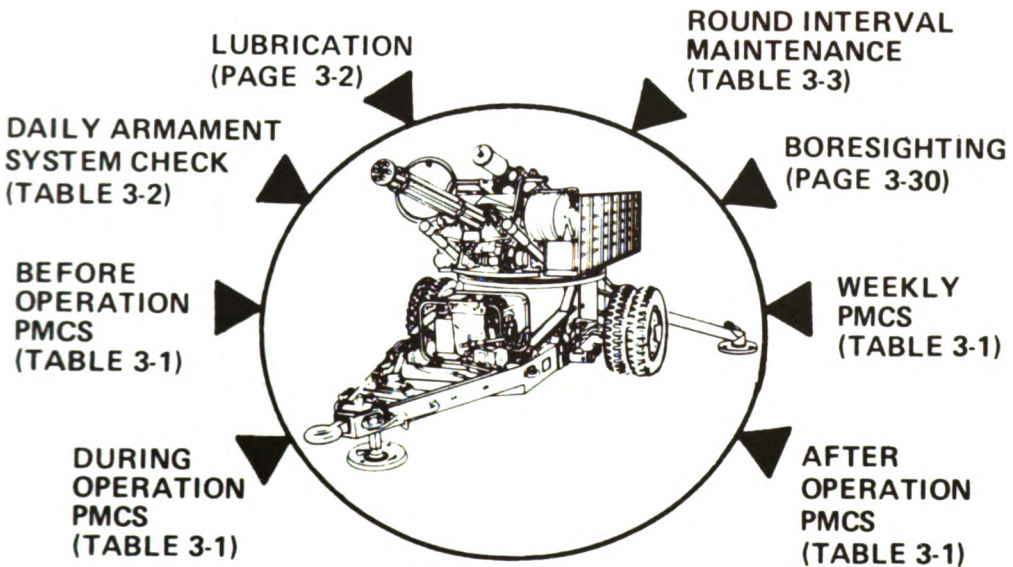
CHAPTER 3

MAINTENANCE INSTRUCTIONS

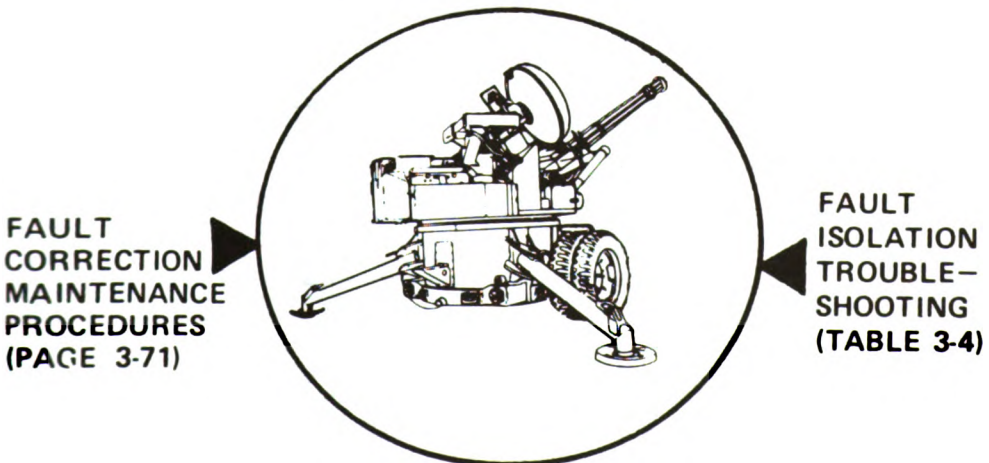
3-1. Introduction. This chapter contains preventive and corrective maintenance procedures that are required to keep your M167A1 serviceable and ready for action. The instructions that follow are your responsibility.

3-2. The first illustration that follows shows preventive maintenance described in this chapter. The second illustration shows corrective maintenance.

SYSTEMATIC PREVENTIVE MAINTENANCE



CORRECTIVE MAINTENANCE



Section I. TOOLS AND EQUIPMENT

3-3. Tools and equipment issued for your use to maintain the system are listed and illustrated in Appendix B. Use only the tools that are provided and make sure they fit properly. Do not use tools or equipment for purposes other than those prescribed. When not in use, make sure tools and equipment are stored properly. Storage locations are given in Appendix E.

This is a DA Form 627372, titled "MAINTENANCE REQUEST". It contains several sections for recording maintenance actions, including fields for equipment identification, maintenance actions performed, and status. The form is numbered 627372 in the top left corner.

Section II. FORMS AND RECORDS

3-4. System Logbook. Your system logbook contains a collection of DA Forms that are described in DA PAM 738-750. These forms must be kept up-to-date. As soon as possible after completing any maintenance action, including firing or cycling rounds, you must make an appropriate entry on the applicable DA Form. The logbook is a maintenance record of your M167A1 system and should always reflect its current status.

This image shows a stack of DA Forms, including DA Form 627372, which is a maintenance request form. The forms are stacked on top of each other, showing the top of several forms. The forms are numbered 627372 in the top left corner.

Section III. LUBRICATION

3-5. Lubrication and Service Intervals. Consult LO 9-1005-286-13. This tells you when to lube, what to lube, and what kind of lube to use. Requisitioning information regarding lubricants can be found in Appendix D.

3-6. Lubrication During Unusual Conditions. Lubricants can quickly lose their protective qualities when exposed to extremely high or low temperatures, dust, sand, or moisture. Prolonged high-rate operation can also break down lubricants. Lubricate more often to compensate for these unusual conditions. Lubrication intervals may be extended during inactive periods.

Section IV.

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-7. General. At the specified intervals, the applicable PMCS listed in table 3-1 will be performed. The PMCS table has been changed to make checks easier. The number of specified checks have also been reduced to those absolutely essential. Before you begin the PMCS, keep in mind the following general information which is just as important as the specific checks.

- a. **Before you operate.** Always keep in mind the CAUTIONS and WARNINGS. Perform your before operation (B) PMCS.
- b. **While you operate.** Always keep in mind the CAUTIONS and WARNINGS. Perform your during operations (D) PMCS.
- c. **After you operate.** Be sure to perform your after operation (A) PMCS.
- d. **If your equipment fails to operate.** Troubleshoot with proper equipment. Report any deficiencies which can not be corrected on DA Form 2404.

GENERAL PROCEDURES

3-8. The following general procedures apply to crew preventive maintenance services and to all inspections and are just as important as specific procedures.

3-9. Inspection. Inspection to see if items are in good condition, correctly assembled or stored, secure, not excessively worn, not leaking, and adequately lubricated applies to most items in the preventive maintenance checks and services. Any or all of these checks that are pertinent to any item (including supporting, attaching, or connecting members) should be performed automatically as general procedures in addition to any specific procedures given.

IMPORTANT — Before using dummy rounds, always clean and inspect for damage. Also check the ammo links. Burred and dirty dummy rounds can cause excessive wear and damage.

- a. Inspection for good condition.
 - Visual inspection for damage beyond safe or serviceable limits.
- b. Inspection for correct assembly and stowage.
 - Visual inspection for improperly assembled or stowed items.
- c. Inspection for security.
 - Visual inspection or check by hand, wrench, or prybar for looseness.
- d. Inspection for wear.
 - Visual inspection or check by hand for items worn beyond serviceable limits. Also, applicable to markings, data, caution plates, and printed matter that is illegible.

NOTE: Where the instruction "tighten" appears in the procedure, it means tighten with the proper tool, even if the item appears to be secure.

3-10. Cleaning. Any special cleaning instructions required for specific components or parts are contained in the pertinent section. General cleaning instructions are as follows:

WARNING



Dry cleaning solvent is flammable and should not be used near an open flame. Fire extinguishers should be nearby when these materials are used. Use only in well ventilated places. The use of diesel fuel oil, gasoline, or benzine (benzol) is prohibited for cleaning purposes.



- a. Use dry cleaning solvent (SD-2, item 2, appendix D) to clean all unpainted metal parts.
- b. **IMPORTANT** - Don't clean interior or exterior of upper carriage with steam water, or air under pressure.
- c. Dry cleaning solvent (SD-2, item 2, appendix D) may be used for dissolving grease and oil. After cleaning, use cold water to rinse off solution. See paragraph 3-11b.

GENERAL PROCEDURES - CONTINUED

CAUTION

All parts treated with CLP should remain uncovered for a minimum of 2 hours, and 8 hours is desired.

d. After parts are cleaned, rinse and dry thoroughly with a clean dry rag (item 26, appendix D). Apply cleaner, lubricant (CLP, item 3 appendix D) to all unprotected metal surfaces (other than optical instruments) to prevent rusting.

e. When authorized to install new parts, remove any preservative materials such as rust-preventive compound, grease, etc. If parts require lubrication, lubricate per LO 9-1005-286-13.

f. To prevent formation of mildew, shake out and air fabric covers for several hours at frequent intervals. Make immediate repairs of minor damage. Mildewed fabric is best cleaned by scrubbing with a dry brush. If water is necessary to remove dirt, it must not be used until all mildew has been removed. If fabric shows no indication of rotting or weakening, canvas can be retreated.

g. If metal name plates, caution plates, and instruction plates are corroded, clean thoroughly and coat with cleaner, lubricant (CLP, item 3, appendix D).

h. Clean telescope lens with lens paper (item 23, appendix D).

3-11. Cleaning precautions.

a. Dry cleaning solvent evaporates quickly and have a drying effect on skin. If used frequently without gloves, cracks in the skin and a mild irritation or inflammation of the skin may result.

b. Don't get dry cleaning solvent, engine fuels or lubricants on rubber parts because they will deteriorate rubber that is not resistant to petroleum.

3-11.1 Painting. Touch up paint as required in accordance with TB 43-0209.

3-12. Specific procedures. Specific preventive maintenance to be performed on the system is listed in tables 3-1 and 3-3. When performing these services, you must enter the item number and the malfunction, which is beyond your scope to repair, in accordance with requirements of DA PAM 738-750.

3-13. Column entries used in PMCS.

a. Column 1, Item No. Column 1 lists the checks and services to be performed in chronological order. This column will also be used as a source to item numbers for the "TM NUMBER" column on DA Form 2404, Equipment Inspection and Maintenance worksheet, in recording results of PMCS. An asterisk before the item No. indicates a special interval required by adverse conditions. A letter following the item No. refers to information noted at the bottom of the page.

b. Column 2, Interval. Column 2 lists the specified intervals at which the PMCS will be performed. The "B" interval requires the check to be performed "Before Operation". The "D" interval requires "During Operation" check. The "A" interval requires the check to be performed "After Operation". The remaining intervals "W" and "M" require "weekly" and "monthly" checks, respectively.

c. Column 3, Item to be inspected. Column 3 identifies the position of the system to be inspected and describes the procedure by which the change is to be performed.

d. Column 4, Equipment is not ready/available if. Column 4 contains the criteria which will render the system incapable of performing its primary mission. The terms "ready/available" and "mission capable" refer to the same status--Equipment is on hand and is able to perform its combat mission (see DA PAM 738-750).

Table 3-1. Preventive Maintenance Checks and Services – Continued

B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY

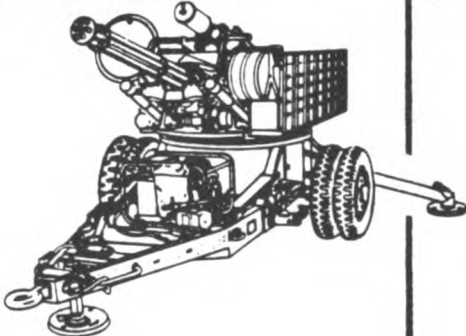
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/ AVAILABLE IF:
	B	D	A	W	M		
						M167A1 SYSTEM Be alert during your PM checks for unusual noises or odors that might indicate something is wrong. GENERAL NOTE Lubricate in accordance with LO 9-1005-286-13.	
1	•		•			<u>Systems Log Book.</u> Determine status of system.	
2	•					CARRIAGE <u>General.</u> Make a walkaround inspection of lower carriage checking components for damage or misalignment. Manually rotate the mount 360 degrees and elevate to +80 degrees to ensure that nothing will interfere with movement of the upper carriage and cannon. Check slip ring latch and cover for damage. Make sure latch is engaged. Check safety chain to ensure it is at least 5½ ft.  Check seat adjustments.	Major components missing or damaged. Carriage mount will not rotate and/or cannon will not elevate. Erratic movement during elevating or depressing cannon. Erratic mount movement. Slip ring latch cover is damaged. Chain is too short or missing. Seat is missing.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATION

D - DURING
OPERATION

A - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

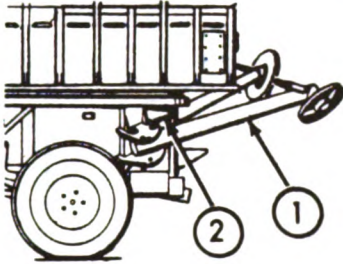
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
3	•		•			 Suspension System. Make sure outriggers (1) and locking pins (2) are clear of obstructions such as mud or ice. If lower carriage is resting on wheels, pull outrigger pins and check outriggers for freedom of movement. Place front drop pad alternately in firing and traveling positions. Alternately place the running gear in firing and travel position and lock it in each position. Check tires and wheels for tread depth of more than 1/8". If depth is 1/16" or less, replace tire. Check wheels for bends or damage. Check tire pressure for 45 PSI. Check wheels for missing or loose lug nuts and studs.	Arm assembly inoperative. Drop pad cannot be lowered or retracted. Right or left axle arm assembly broken or inoperative. Lock pin cannot be retracted or placed in travel position. One tire is flat or unserviceable. Wheels are bent or damaged to the extent they affect towing. Two or more of the lug nuts or studs are missing.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATIOND - DURING
OPERATIONA - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

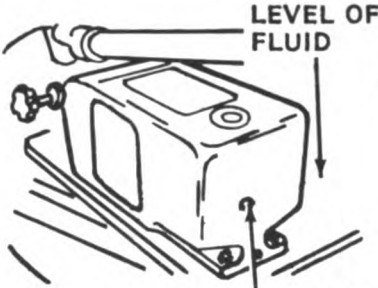
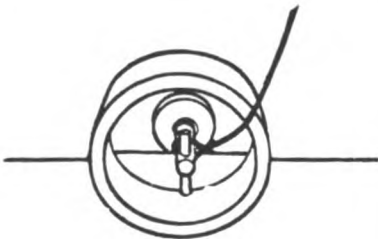
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
4	•		•			 LEVEL OF FLUID 1/4" PIPE PLUG <u>Hydraulic Fluid.</u> This check can only be made when system is resting on wheels and carriage is approximately level. Check hydraulic fluid by removing 1/4" plug from end of reservoir. Fluid level should be up to plug hole. Before replacing plug, apply tape (MIL-T-27730, item 27 appendix D) to threads. Operate the hydraulic system and check for proper function and leaks.	System cannot be raised or lowered.
5	•		•			<u>Drain Plug.</u> Remove drain plug and drain all water. Install drain plug. 	

Table 3-1. Preventive Maintenance Checks and Services - Continued

**B - BEFORE
OPERATION**

**D - DURING
OPERATION**

**A - AFTER
OPERATION**

W - WEEKLY

M - MONTHLY

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/ AVAILABLE IF:
	B	D	A	W	M		
6	•		•			ARMAMENT AND RADAR <u>APU</u> Check level of gas and oil with engine shut down. Check cables and connectors for serviceability. Operate the APU to determine condition. The diagram shows a side view of the APU engine compartment. A rectangular panel on the left is labeled 'GAS' with an arrow pointing to it. A circular dipstick on the right is labeled 'OIL' with an arrow pointing to it. Various hoses and electrical connections are visible around the engine block.	Cables or connectors un-serviceable; engine will not start. No generator output. Load switch will not turn on, or variable resistor in-operative.
7					•	<u>LOW VOLTAGE.</u> Turn SYSTEM POWER to ON . Set MODE switch to RADAR . Hold LOW VOLTAGE switch to TEST . LOW VOLTAGE WARNING indicator flashes for approximately 4 seconds, then stays lit. Radar deenergizes. Set LOW VOLTAGE switch to NORMAL . Set SYSTEM POWER to OFF . Wait approximately 4 seconds, then set SYSTEM POWER to ON . Set SYSTEM POWER to OFF .	Radar will not shut down.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATIOND - DURING
OPERATIONA - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

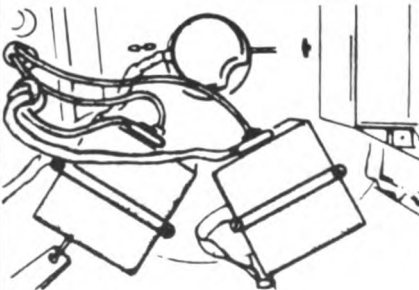
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/ AVAILABLE IF:
	B	D	A	W	M		
8	•					 <u>Batteries.</u> Check exterior of battery case for cleanliness and damage. Make sure cable connectors are secure.	One battery missing or un-serviceable.
9			•			<u>M61 Sight.</u> Clean and inspect (page 3-85).	
10			•			<u>M134 Straight Telescope.</u> Clean and inspect (page 3-5).	
ARMAMENT							
11			•	•		<u>Barrels.</u> a. Check barrels for cracks and bulges. b. Determine remaining round life. Check DA FORM 2408-4. (1) If 5000 rounds have been cycled or fired since last gage, notify organizational maintenance. (2) If 0.035 wear has been achieved and 1500 rounds have been cycled, notify organizational maintenance. c. Clean and inspect (page 3-75). d. Lubricate according to LO 9-1005-286-13.	Barrels have cracks or bulges. If organizational maintenance determines wear is 0.050 or greater.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATION

D - DURING
OPERATION

A - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
12	•					<u>CANNON AND FEED SYSTEM.</u> Perform the following steps to verify timing between the cannon and feed system: a. Remove arming connector from distribution box connector (J6). CAUTION Do not hold BRAKE-CLEAR AND BRAKE switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval. b. Hold BRAKE-CLEAR AND BRAKE switch to BRAKE, rotate cannon by hand until cannon timing pin can be engaged. c. Assure that feeder timing pin can be engaged to verify that timing exists between the cannon and the feeder. CAUTION Verify that both the cannon timing pin and the feeder timing pin disengage when released. c.1 Using dummy ammunition, manually cycle 6 to 12 rounds through cannon and clear cannon. d. Install arming connector.  WARNING Assure that no live ammunition is used in the next step.  e. Refer to firing in the manual mode (page 2-63) and rotate cannon under power.	Cannon does not rotate manually. Timing pin is missing or cannon and feeder timing pin cannot be engaged at the same time. Cannon and feeder fail to cycle and clear rounds. Arming connector is missing. Cannon does not rotate under power.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATIOND - DURING
OPERATIONA - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	REPORTING, EQUIPMENT IS NOT READY/ AVAILABLE IF:
	B	D	A	W	M		
13			•			<u>AN/TVS-2B or AN/TVS-5 Night Sight.</u> Clean and inspect (TM 11-5855-202-13 or TM 11-5855-214-10).	
14			•			Deleted.	
15	•					<u>Azimuth Indicator Lights, and Gunner's Shield Light.</u> Check for operation.	
16					•	RADAR <u>Interconnecting Cables.</u> Check that all connectors are secure and check all cables for excessive wear, damage, or kinks. Check interconnecting waveguide for cracks and proper fastening at flanges. Check that RF gaskets are installed at cable connectors.	Any cable is missing or broken.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY

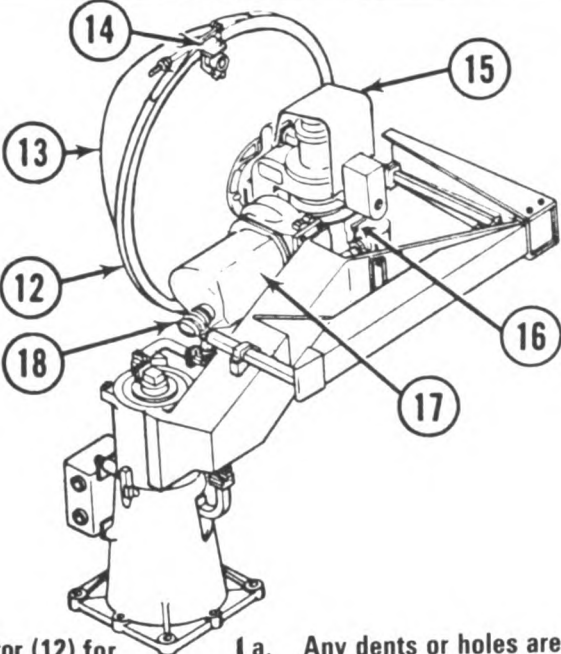
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	REPORTING, EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
17						 ANTENNA a. Check reflector (12) for dents, holes, or other damage. b. Check radome (13) for cracks, or loose hardware. Check lockwiring of draw latch handle. c. Check boresight telescope bracket and clamps (14) for loose or damaged hardware. d. Check waveguide (15) for cracks and proper fastening at flanges. e. Check that covers on traverse servo drive (16) and elevation servo drive (17) are secure. f. Check that elevation input coupling (18) setscrews and cover clamps are not loose. g. Check stops, bumpers, and connectors for looseness or damage. a. Any dents or holes are present. c. Any bracket or clamp is loose or damaged. d. Waveguide has cracks or is not properly fastened at flanges. Damaged protective coating will not deadline system. f. Setscrews and clamps are loose and cannot be tightened.	

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATIOND - DURING
OPERATIONA - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

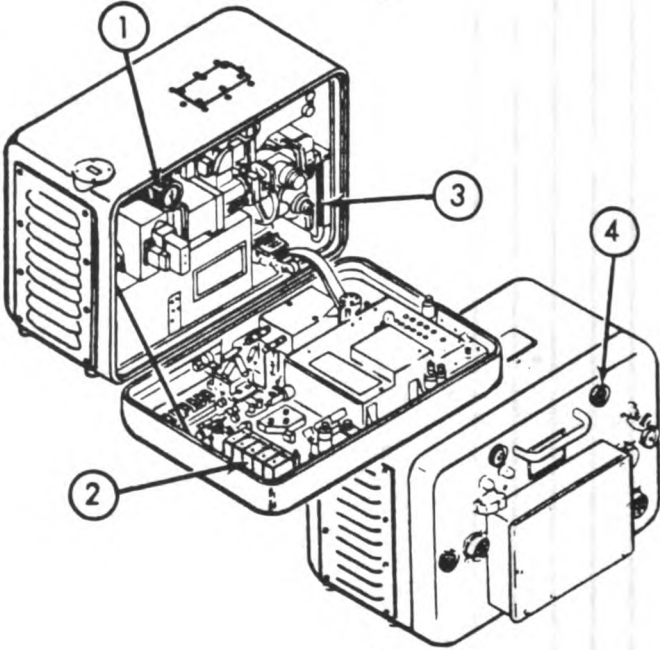
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
18						 <u>Receiver-Transmitter</u> a. Loosen thumbscrews under base-plate and wing fasteners, and remove cable guard from right side of system.	

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATION

D - DURING
OPERATION

A - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/ AVAILABLE IF:
	B	D	A	W	M		
						b. Check inside for broken wires or cables. c. Check that tuning tool (1) is snug-tight in bracket. d. Check that crystals (2) are properly installed. e. <u>IMPORTANT</u> - Check that ventilators are unobstructed and allow free flow of air. Otherwise failures due to overheating will occur. NOTE Clean air filter daily when operating in dusty or sandy areas. f. Clean air filter (3), page 3-87. g. Check that all thumbscrews (4) are snug-tight when front panel is closed. h. Install cable guard.	b. Any lead or cable is broken. c. Tuning tool is missing. d. All crystals are missing.

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY

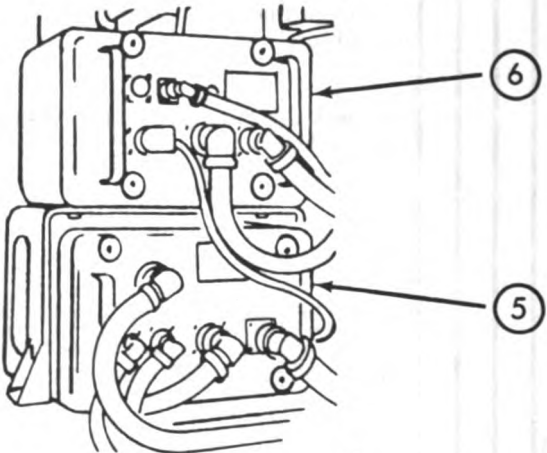
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	REPORTING, EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
19						 Receiver and Range Computer. Remove cable guard on right rear of vehicle by pulling pin on each side and loosening thumbscrews under baseplate. Check exterior of receiver (5) and computer (6) for damage. Make sure all thumbscrews on receiver and computer are snug-tight. Install cable guard.	

Table 3-1. Preventive Maintenance Checks and Services - Continued

**B - BEFORE
OPERATION**

**D - DURING
OPERATION**

**A - AFTER
OPERATION**

W - WEEKLY

M - MONTHLY

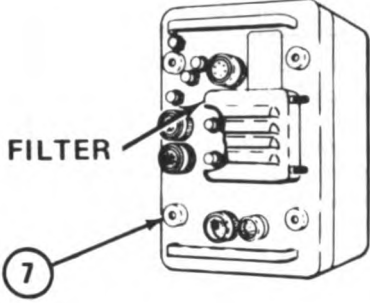
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
20						 Power Supply. Remove cable guard on left rear of vehicle by pulling pin on each side and loosening thumbscrews under baseplate. Check exterior of power supply (5) for damage. Make sure all thumbscrews are snug-tight. IMPORTANT- Make sure that air intake and exhaust ports are unobstructed and allow free flow of air. Otherwise, failure due to overheating will occur. Check that both front and back louver plates are mounted to shed water (openings toward the ground). Install cable guard. Clean air filter (page 3-88). NOTE Clean air filter daily when operating in dusty or sandy areas.	

Table 3-1. Preventive Maintenance Checks and Services - Continued

**B - BEFORE
OPERATION**

**D - DURING
OPERATION**

**A - AFTER
OPERATION**

W - WEEKLY

M - MONTHLY

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
18						<u>Receiver-Transmitter</u> a. Loosen thumbscrews under base-plate and wing fasteners, and remove cable guard from right side of system.	

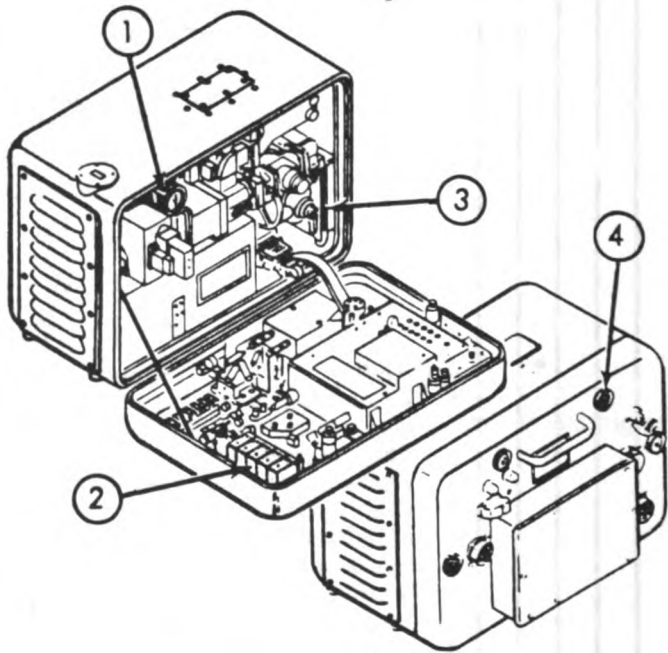


Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATION

D - DURING
OPERATION

A - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
						b. Check inside for broken wires or cables. c. Check that tuning tool (1) is snug-tight in bracket. d. Check that crystals (2) are properly installed. e. <u>IMPORTANT</u> - Check that ventilators are unobstructed and allow free flow of air. Otherwise failures due to overheating will occur. NOTE Clean air filter daily when operating in dusty or sandy areas. f. Clean air filter (3), page 3-87. g. Check that all thumbscrews (4) are snug-tight when front panel is closed. h. Install cable guard.	b. Any lead or cable is broken. c. Tuning tool is missing. d. All crystals are missing.

Table 3-1. Preventive Maintenance Checks and Services – Continued

B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY M - MONTHLY

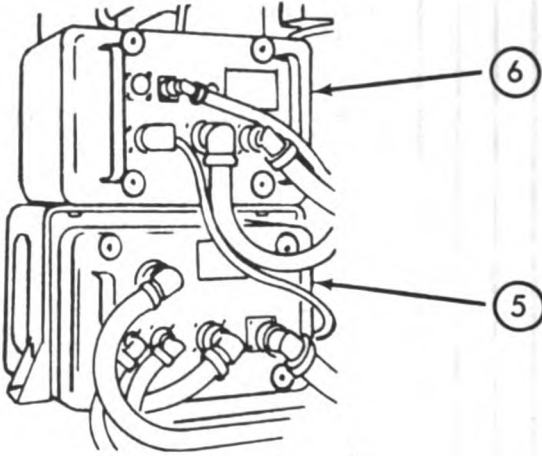
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	REPORTING, EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
19						 Receiver and Range Computer. Remove cable guard on right rear of vehicle by pulling pin on each side and loosening thumbscrews under baseplate. Check exterior of receiver (5) and computer (6) for damage. Make sure all thumbscrews on receiver and computer are snug-tight. Install cable guard.	

Table 3-1. Preventive Maintenance Checks and Services - Continued

B - BEFORE
OPERATION

D - DURING
OPERATION

A - AFTER
OPERATION

W - WEEKLY

M - MONTHLY

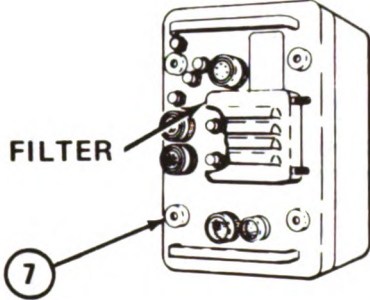
ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
20						 • Power Supply. Remove cable guard on left rear of vehicle by pulling pin on each side and loosening thumbscrews under baseplate. Check exterior of power supply (5) for damage. Make sure all thumbscrews are snug-tight. IMPORTANT- Make sure that air intake and exhaust ports are unobstructed and allow free flow of air. Otherwise, failure due to overheating will occur. Check that both front and back louver plates are mounted to shed water (openings toward the ground). Install cable guard. Clean air filter (page 3-88). NOTE Clean air filter daily when operating in dusty or sandy areas.	

Table 3-1. Preventive Maintenance Checks and Services - Continued

**B - BEFORE
OPERATION**

**D - DURING
OPERATION**

**A - AFTER
OPERATION**

W - WEEKLY

M - MONTHLY

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY / AVAILABLE IF:
	B	D	A	W	M		
21	•					Armament System Check. Perform the Daily System Armament Check (page 3-19). This completes the preventive maintenance checks and services. Make entries in the log book that are required by DA PAM 738-750.	System fails one or more checks.

Section V. DAILY ARMAMENT SYSTEM CHECK

3-13. Perform this daily armament system check (table 3-2) every day after completion of your Before Operation PMCS. While performing the check, watch for any indication that appears abnormal — whether listed or not. Notify organizational maintenance of any abnormal or faulty condition that is beyond the repair capability of crew maintenance.

3-14. Table 3-2 includes all the checks necessary to prove the system operational. Set up the Precheck Conditions of step 1 then perform the checks in sequence as listed.

Table 3-2. Daily Armament System Check

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. PRECHECK CONDITIONS		
Item/Control	Condition/Position	
Arming connector	removed	
Sight caging knob	CAGED	
LOW VOLTAGE	NORMAL	
SYSTEM POWER	OFF	
GUN POWER	OFF	
RANGE in meters	500	
TARGET SPEED in knots	300	
GUN CLEAR	AUTO	
Stow control MODE	NORM	
Stow control MAINT	OFF	
Distribution box circuit breakers (4)	RESET (press in)	
Power supply circuit breakers	Reset (Press in)	
NORM-STATIC-TEST	NORM (forward)	
Cannon	unstow	
Azimuth and elevation drive motor brakes	<u>on</u>	
APU	Operating and adjusted for proper voltage (page 2-77).	
MODE	MAN	
Radar antenna	In operational position	

2. SYSTEM POWER CHECK

- (1) Set SYSTEM POWER to ON

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
	Sight reticle lights after approximately 10 seconds.	Perform step (2)
(2) Rotate SIGHT LAMP knob both ways from OFF.		
	Reticle intensity increases in both directions.	Page 3-69
(3) Check that LOW VOLTAGE warning indicator is extinguished.		Page 3-66
(4) Check that fans in radar power supply and receiver transmitter operate.		
	Fan will operate.	Notify organizational maintenance
(5) Electrically unstow radar antenna (page 2-49.)		Page 3-66
3. FIRING INTERRUPTER CIRCUITS CHECK		
(1) Position the cannon at 0 degree elevation.		
(2) Open firing interrupter cover and pull the two rods closest to the arrow all the way out.		
(3) Turn GUN POWER switch to ON.		
	NO FIRE WHEN LIT indicator lights.	Check the lamp Page 2-8
(4) Traverse out of the protected area.		
	NO FIRE WHEN LIT indicator goes out.	Notify organizational maintenance
(5) Elevate cannon to maximum elevation. Traverse through and back into the protected area.		
	The NO FIRE WHEN LIT indicator stays lit for approximately 40 degrees azimuth or 700 mils.	Notify organizational maintenance
(6) Push the rods approximately 1/2 way back in.		
	NO FIRE WHEN LIT indicator goes out.	Notify organizational maintenance

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
(7) Reduce elevation slowly.	The NO FIRE WHEN LIT indicator will light at approximately 45 degrees and remain lit.	Notify organizational maintenance
(8) Set fire interrupter to 0 degree elevation (rods all the way in). Turn GUN POWER to OFF and replace cover.		
4. ELEVATION DRIVE MOTOR CUT-OUT CHECK		
CAUTION		
Do not drive cannon into elevation limits at high slew rate.		
(1) Slowly elevate cannon to maximum elevation.	Cannon does not hit mechanical stop. Motor stops running 1/4 inch from stop.	Notify organizational maintenance
(2) Slowly depress cannon to minimum elevation.	Cannon does not hit mechanical stop. Motor stops running 1/4 inch from stop.	Notify organizational maintenance
5. SIGHT TRAVERSE LEAD ANGLE CHECK		
(1) Position cannon at approximately 0 degree elevation.		
(2) Record setting of MUZZLE VELOCITY and AIR DENSITY switches. Then set switches respectively to 1 and 0.7.		
(3) Uncage the M61 sight.		
(4) Traverse to the right or left and adjust the traverse rate until the 2nd dot (200 mil lead angle dot) stabilizes at the white indicator arrow (lead angle index). When a stable rotation rate is reached, time one complete rotation of the mount.		
	Time for one revolution is between 16 and 20 seconds.	Notify organizational maintenance

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
(5) Continue to traverse and press the sight cage switch on the left-hand grip.	Sight reticle moves towards the center.	Notify organizational maintenance
6. SUPER ELEVATION CHECK FOR MANUAL AND EXTERNAL MODES		
(1) Connect external range control to receptacle on service panel.		
(2) Set TARGET SPEED to 0. Position cannon so that the bottom of inner circle of sight reticle is on a fixed target (distant aiming point) with cannon at about zero degree elevation (0° mark on linkage arm).		
(3) Set the NORM-STATIC-TEST switch to STATIC (center position).		
(4) On control panel, set RANGE to approximately 1500 and press the action switch.		
	The center of inner circle repositions on the target.	Notify organizational maintenance
	(5) Set MODE switch to EXT and meters X100 on external range control to 15.	
	The READY WHEN LIT indicator goes out; the center of the sight inner circle repositions on the target.	Notify organizational maintenance
	(6) Set MODE switch to MAN.	
	The READY WHEN LIT indicator lights after 2 minutes $\pm$ 15 seconds.	Notify organizational maintenance.

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
(7) On control panel, set RANGE to 2500. Set TARGET SPEED to 600.	Top of sight inner circle repositions on the target.	Notify organizational maintenance
(8) Set MODE switch to EXT	READY WHEN LIT indicator goes <u>out</u> .	Notify organizational maintenance
(9) Set METERS X100 on external range control to 25.	Top of sight inner circle repositions on the target.	Notify organizational maintenance
(10) Press and hold the action switch and the pushbutton on the external range control.	Sight ready-to-fire indicator lights.	Notify organizational maintenance
(11) Release action switch and pushbutton on external range control.	Ready-to-fire indicator goes <u>out</u> .	Notify organizational maintenance
(12) On control panel, set MODE switch to MAN. Set the RANGE fully counterclockwise, and set TARGET SPEED to zero.		
(13) Set NORM-STATIC-TEST switch to NORM and position cannon so that bottom of the inner circle of sight reticle is on the target.		

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
(14) Manually cage the sight.	The target is approximately in the center of the inner circle of the sight reticle.	Notify organizational maintenance
(15) Disconnect and stow the external range control.		

7. SIGHT CURRENT GENERATOR CHECK

- (1) Set MUZZLE VELOCITY switch on sight current generator to 4.
- (2) Set AIR DENSITY switch to 0.95. Position cannon at approximately 0 degree elevation.
- (3) Set MODE switch to TEST.
- (4) Press the action switch.

GOOD WHEN LIT indicator lights after approximately 2 seconds and stays on as long as pressure is applied to right or left action switch.

Notify organizational maintenance

- (5) Release action switch.

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
-------	----------------------	---------------------------------

(6) Set MUZZLE VELOCITY and AIR DENSITY switches back to the setting of the day.

8. RADAR CHECK

WARNING



High voltage is present in receiver-transmitter when energized in standby or radiate condition. Death or injury can result from contact with this high voltage. Observe safety precautions.



NOTE

Receiver-transmitter panel door will be open for steps (1) through (9) and interlock switch at service position.

- (1) Check to make sure radar is at desired frequency. If frequency must be changed, refer to page 3-47 for instructions.
- (2) Make sure all six circuit breakers on radar power supply are in reset (pressed in) position.
- (3) Set MODE switch to RADAR and wait two (2) minutes $\pm$ 15 seconds for system to warm up.

READY WHEN LIT light goes on.
Radar is in standby.

Notify organizational maintenance

- (4) Set receiver-transmitter CLUTTER LOCKON switch to NORMAL.
- (5) Set stow control MODE switch to NORM.
- (6) Set stow control MAINT switch to OFF.

Make sure receiver-transmitter HIGH VOLTAGE POWER SUPPLY OVERLOAD indicator and MODULATOR OVERLOAD indicator are not lit.

Page 3-68

WARNING



Radar emissions are hazardous within three feet in front of the antenna.



Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
CAUTION Do not radiate at targets closer than 250 meters. This will damage the radar. (7) Depress action switch and reposition cannon in both azimuth and elevation.		
	Antenna repositions to align with the axis of the cannon.	Page 3-66
NOTE When radar is energized to radiate and either of the receiver-transmitter overload indicators light, momentarily set OVERLOAD RESET switch to RESET (to reset overload sensing circuit). If overload continues, notify organizational maintenance.		
NOTE If HIGH VOLTAGE SUPPLY OVERLOAD and MODULATOR OVERLOAD indicators are not lit and the radar will not radiate, the +28 Vdc overload circuitry (light pipe) in the 2A2 may have tripped. To reset, turn SYSTEM POWER to OFF and then back ON. If radar will not radiate after two minutes ± 15 seconds, notify organizational maintenance.		
(8)	Set SERV RAD CONT switch to ON.	
	Observe RF power meter for indication.	Page 3-67
(9)	Set SERV RAD CONT switch to OFF. Close receiver-transmitter panel door.	
NOTE After closing panel door wait 2 minutes ± 15 seconds. When READY WHEN LIT indicator illuminates radar is in standby condition.		
(10)	Set receiver-transmitter CLUTTER LOCKON switch to TEST. Connect headset connector to J4 connector on the receiver-transmitter.	

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
(11)	Aim at a point in the sky above a fixed target 250 to 2000 meters distant. Hold action switch pressed and depress footswitch. Radar radiates. Ready-to-fire indicator does not light and no tone is heard in headset.	
(12)	Acquire target in sight reticle. Ready-to-fire indicator lights and tone is heard in headset indicating clutter lockon has occurred.	
(13)	Elevate cannon towards original position. Tone stops and ready-to-fire indicator goes out when target disappears from sight reticle.	Notify organizational maintenance
(14)	Set CLUTTER LOCKON switch to NORMAL. Remove headset connector from J4. NOTE: Two crewmen are required for the following steps.	
	WARNING Make sure all personnel are clear of mount before performing the following steps.	
		
	(15)	Manually uncage the sight.
(16)	Depress the MID-RANGE CALIBRATION PRESS TO TEST pushbutton on the range computer. MID-RANGE CALIBRATION indicator lights brightly.	Notify organizational maintenance

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
(17)	Release MID-RANGE CALIBRATION PRESS-TO-TEST pushbutton.	
	Indicator remains lit for not more than three seconds, then resumes blinking.	Notify organizational maintenance
(18)	Press action switch and slowly elevate cannon.	
	Cannon elevates smoothly.	Notify organizational maintenance

WARNING



After pushbutton is pressed in following step, cannon slew speed will increase. Ensure all personnel are clear of cannon to avoid injury.



- (19) Press MID-RANGE calibration pushbutton on range computer (Unit 4) while cannon is elevating.

- a. Cannon speeds up in direction of travel.
- b. Sight reticle and radar antenna move in direction opposite to cannon movement and in elevation with the apparent target.
- c. MID-RANGE CALIBRATION indicator lights brightly then resumes blinking.

Notify organizational maintenance.

- (20) Deleted.

Table 3-2. Daily Armament System Check - Continued

CHECK	NORMAL INDICATION	IF INDICATION IS ABNORMAL
(21) Cage the sight.		
9. GROUND MODE CHECK		
(1) Set MODE switch to GRD.		
	Sight reticle remains illuminated.	Notify organizational maintenance.
(2) Traverse and elevate the cannon.		
	Cannon traverses and elevates normally.	Pages 3-58 3-59 3-60
10. BORESIGHTING		
(1) If the cannon requires boresighting at this time, continue with the applicable method (page 3-30 or 3-39). If the cannon does not require boresighting, shut down the system according to the next step.		
(2) Shut down the APU engine. Install arming connector in the firing interrupter. Set all the controls to PRECHECK POSITION as shown at beginning of this Daily Armament System Check.		

BORESIGHTING

BORESIGHTING, DISTANT AIMING POINT METHOD

3-15. Use this method when there is good visibility for at least 2500 meters. If visibility does not extend this far, use the Boresight Target Method on page 3-39.

1. Set GUN POWER switch to OFF.
2. Remove arming connector from firing interrupter and set NORM-STATIC-TEST switch (on system distribution box) to NORM.
3. Clear cannon - hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE position and rotate cannon barrels two complete revolutions. Remove any rounds in the case chute.

NOTE: In step 4, time the cannon without regard to the No. 1 barrel position if you are using a ground role (circular) muzzle clamp.

CAUTION

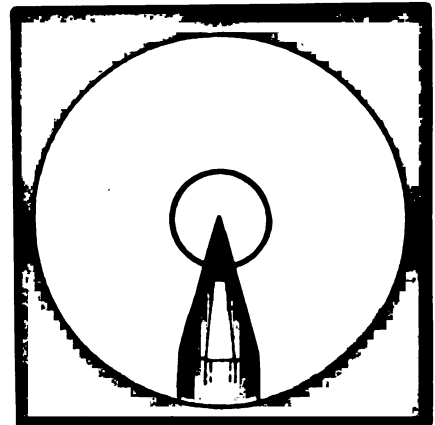
To prevent damage to the index pin, slowly rotate barrels. Insure brake-clear and brake switch is not used more than 10 seconds out of each minute as damage to the feeder solenoid may result.

4. Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE, depress cannon index pin, and position the No. 1 barrel (marked on elliptical air defense muzzle clamp) in firing position at 4 o'clock as viewed from muzzle end. Release switch and index pin. Check that pin has returned to normal (out) position.
5. Set SYSTEM POWER switch to ON and MODE switch to RADAR.
6. Set stow control MAINT switch to ON and stow control MODE switch to NORMAL.
7. Select a distant aiming point at least 2500 meters away. Train the cannon to approximate position for boresighting.

CAUTION

In the MAN, RADAR, EXT, or TEST modes, the M61 sight should not be mechanically uncaged until reticle illumination (approximately 10 seconds).

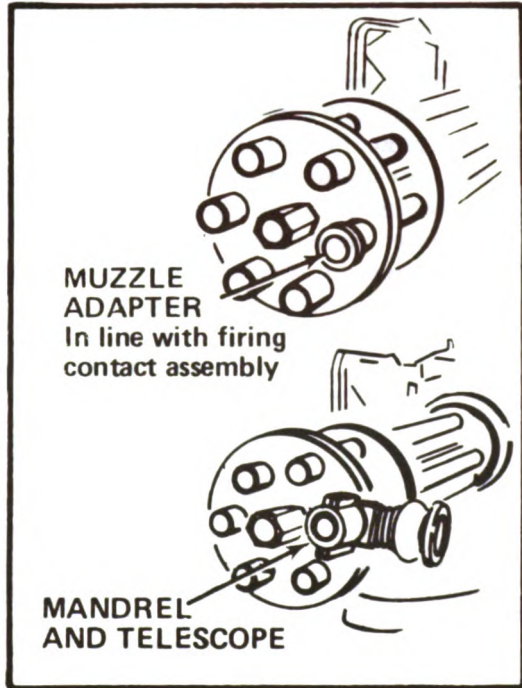
8. Mechanically uncage sight, and position cannon so that distant aiming point is centered in the inner reticle of sight. Release action switch and mechanically cage sight.



9. On the distribution box, set NORM-STATIC-TEST switch to STATIC. Set SYSTEM POWER switch to OFF.

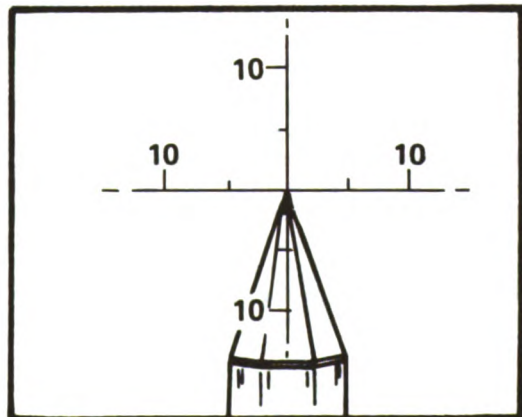
BORESIGHTING, DISTANT AIMING POINT METHOD - CONTINUED

10. Insert muzzle adapter from boresight kit into muzzle of No. 1 barrel (4 o'clock position).



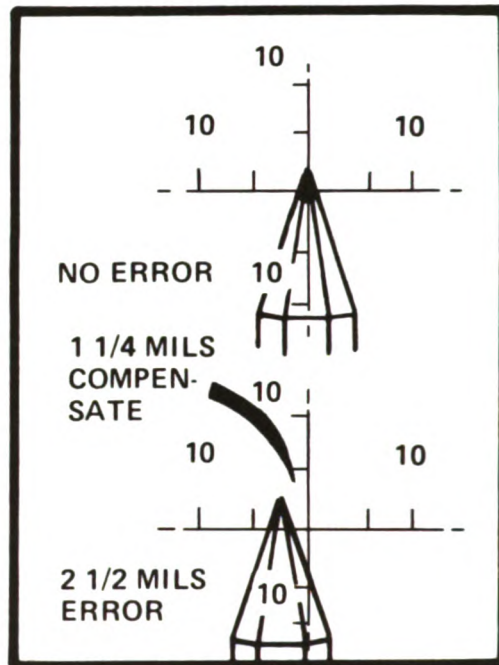
11. Make sure the mandrel and boresight telescope are properly assembled, then insert the assembly into the muzzle adapter with the eyepiece in horizontal position. Press to tighten the assembly in barrel.

12. Release elevation and azimuth drive motor brakes. Hold cannon to left down. Sight through the telescope and line up a distinctive feature of the distant aiming point in crosshairs. Lock the elevation and azimuth drive motor brakes; recheck to determine if point originally sighted on is still at crosshairs. If not, unlock, reposition, and lock.



BORESIGHTING, DISTANT AIMING POINT METHOD - CONTINUED

- 13. Hold the cannon up and to the right. Sight through boresight telescope to determine if crosshairs are displaced less than 4 mils (in either azimuth or elevation) from aiming point. If displaced more than 4 mils, discontinue procedure and notify organizational maintenance.



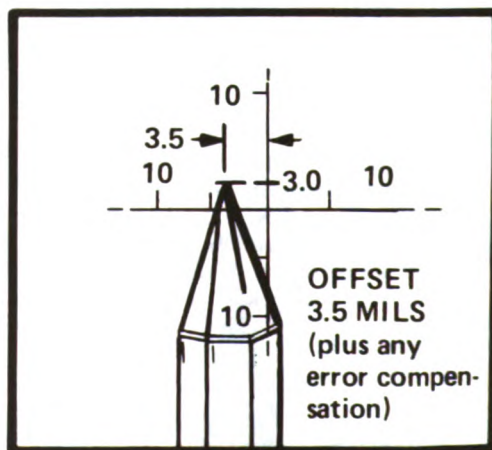
- 14. Rotate mandrel and telescope assembly 180 degrees to horizontal position on opposite side of barrel. Sight through telescope and determine if point originally sighted on is still at the crosshairs. If crosshairs are displaced over 5 mils from point sighted on, bore sight kit is defective. If crosshairs are displaced less than 5 mils, continue to use the kit. Compensate for under 5 mil error by offsetting the crosshairs from aiming point by one-half of the error.

NOTE: Before sighting at a distant aiming point, always hold cannon down and to the left to compensate for system backlash.

- 15. Rotate boresight telescope and mandrel so that eyepiece is in vertical position. Unlock the elevation and azimuth drive motor brakes and manually position cannon so that crosshairs of the telescope are 3.0 mils below and approximately 3.5 mils (plus any error compensation) to the right of the aiming point. Lock the elevation and azimuth drive motor brakes and check that the crosshairs haven't moved.

CAUTION

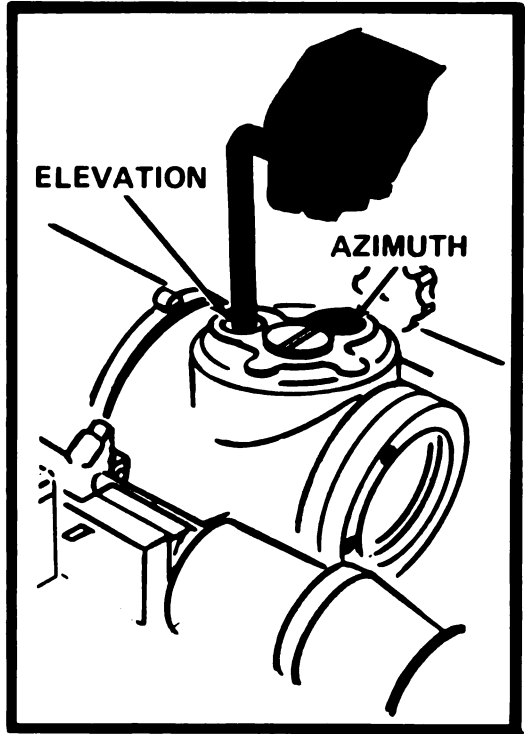
In the MAN, RADAR, EXT or TEST modes, the M61 sight should not be mechanically uncaged until reticle illumination (approximately 10 seconds).



- 16. Set SYSTEM POWER switch to ON. Manually uncage the sight and adjust the control assembly SIGHT LAMP knob for a clear reticle in the sight.

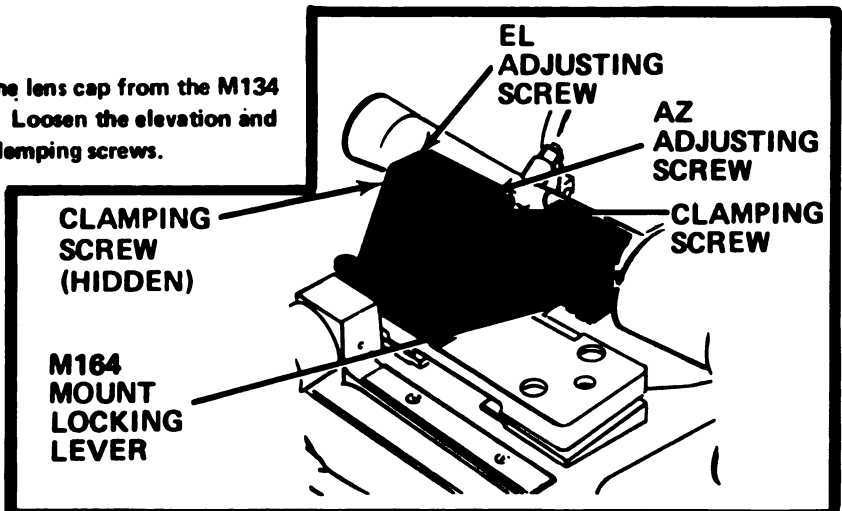
BORESIGHTING, DISTANT AIMING POINT METHOD - CONTINUED

17. Remove screw caps from the elevation and azimuth adjustment access holes on top of the sight. Do not disturb the third cap.
18. Have a second crewman look through the telescope as adjustments are being made to make sure the cannon does not move.
19. As you make the following adjustments, move your eye up and down, and right and left to minimize the apparent shifting of the target. Watch the sight reticle and turn the elevation and azimuth adjustment bolts until the inner sight reticle is centered on the distant aiming point.



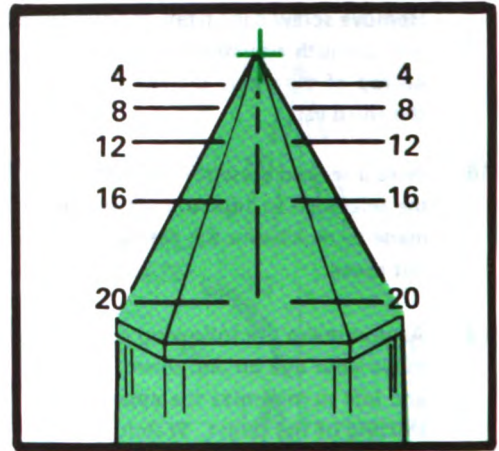
20. Install the screw caps on the adjustment access holes.
21. If the M134 straight telescope is to be used, install it on the M164 mount according to page 2-33, and boresight it as follows:

22. Remove the lens cap from the M134 telescope. Loosen the elevation and azimuth clamping screws.

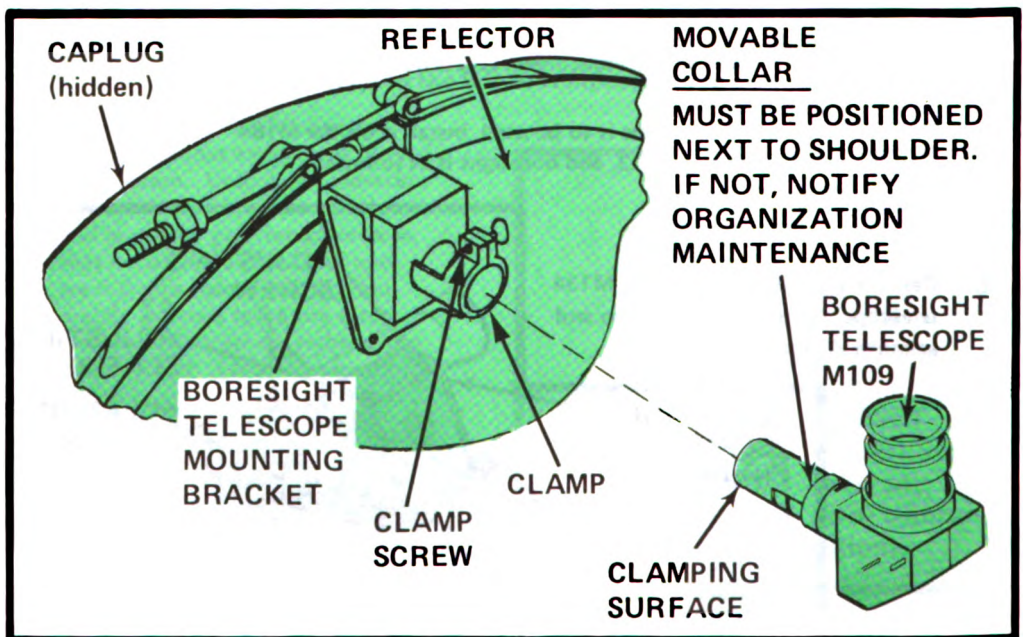


BORESIGHTING, DISTANT AIMING POINT METHOD - CONTINUED

23. Look through the M134 telescope and turn the AZ adjusting screw to bring crosshairs of the reticle into verticle alignment with the distant aiming point.
24. Turn the EL adjusting screw to bring crosshairs of the reticle into horizontal alignment with the distant aiming point.
25. Tighten clamping screws and install lens cover.
26. Remove boresight telescope and mandrel assembly from muzzle adapter.



WARNING: Be sure to remove muzzle adapter from cannon barrel.



27. Remove telescope from mandrel and install in the telescope mounting bracket on the antenna. Remove caplug from front of radome.

BORESIGHTING, DISTANT AIMING POINT METHOD - CONTINUED

28. Use a second crewman to make sure that the M61 sight reticle is centered on the distant aiming point before, during, and after the next adjustments.

IMPORTANT

Any pressure on antenna or telescope will cause error.

WARNING

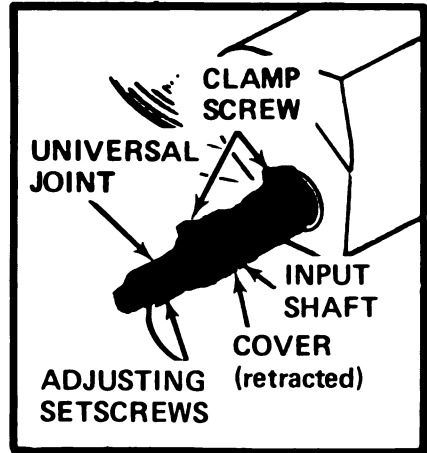


Make slight adjustments when rotating elevation input shaft to avoid injury to personnel if antenna moves abruptly.



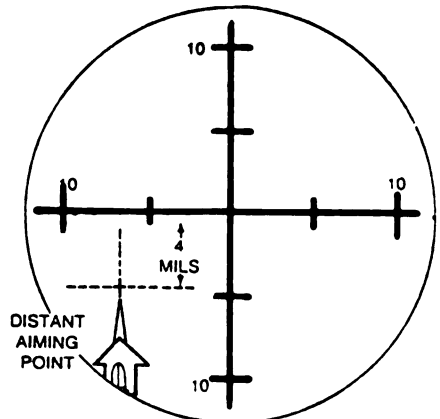
29.

Loosen clamp screw on gunner's side of the elevation input shaft coupling to the radar antenna. Retract cover to expose universal joint setscrews. Loosen setscrews and rotate elevation input shaft to move boresight telescope reticle above, below, or on the distant aiming point as indicated by the antenna correction label affixed to antenna. Tighten setscrews, replace cover and tighten clamp screws.



NOTE

Sample antenna corrections label below specifies that the radar input shaft should be rotated until the horizontal crosshair of boresight telescope is 4 mils above the distant aiming point. If label is missing, contact organizational maintenance.



ANTENNA CORRECTIONS

Set Horiz	Crosshair	<u>4</u>	Mils Above Aiming Point
Set Horiz	Crosshair	_____	Mils Below Aiming Point
Set Vert	Crosshair	_____	Mils Left of Aiming Point
Set Vert	Crosshair	<u>7</u>	Mils Right of Aiming Point

BORESIGHTING, DISTANT AIMING POINT METHOD - CONTINUED

30. Remove the access cover from traverse boresight adjustment, which is located on the reflector and feed housing assembly. Loosen locking clamp screw. Turn traverse adjustment shaft until vertical crosshair on the boresight telescope reticle is to the left, right or intersects the distant aiming point. Tighten locking clamp screw and replace access cover.

NOTE

Sample antenna corrections label below specifies that the traverse adjustment shaft should be set to position the verticle crosshair of boresight telescope 7 mils to the right of the distant aiming point. If label is missing, notify organizational maintenance.

ANTENNA CORRECTIONS

Set Horiz Crosshair _____ 4 _____ Mils Above Aiming Point
 Set Horiz Crosshair _____ Mils Below Aiming Point
 Set Vert Crosshair _____ Mils Left of Aiming Point
 Set Vert Crosshair _____ 7 _____ Mils Right of Aiming Point

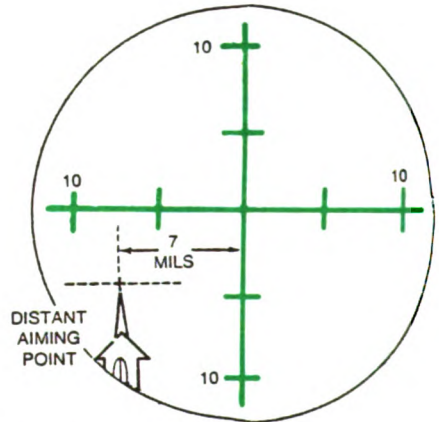
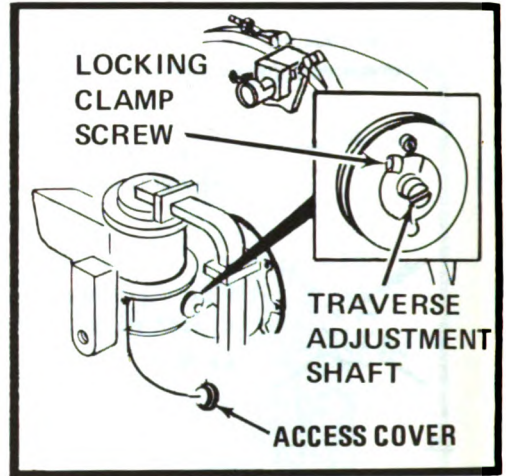
Repeat steps 29 and 30 if necessary to position the boresight telescope crosshairs as indicated by the antenna corrections label.

32. Set stow control MODE switch to STOW.

NOTE

If antenna does not respond in steps 33 through 41, notify organizational maintenance.

33. Using stow control TRAV switch, drive the antenna to the left approximately 10 degrees.
 34. Set stow control MODE switch to NORMAL.
 35. At the boresight telescope mounted on the antenna observe that the crosshairs within the reticle are positioned as indicated by the antenna correction label ± 3 MILS.
 36. Repeat steps (32) through (35) except in step (33) drive the antenna to the right.
 37. Set stow control MODE switch to STOW.



38. Using stow control ELEV switch drive the antenna up approximately 10 degrees.
 39. Set stow control MODE switch to NORMAL.
 40. At the boresight telescope mounted on the antenna observe that the crosshairs within the reticle are positioned as indicated by the antenna correction label ± 3 MILS.
 41. Repeat steps (37) through (40) except in step (38), drive antenna down approximately 10 degrees.

BORESIGHTING, DISTANT AIMING POINT METHOD - CONTINUED

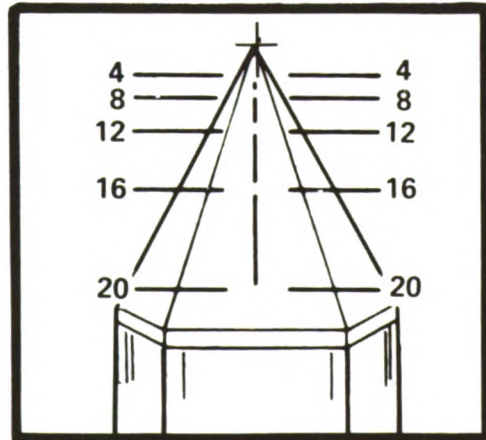
42. Set stow control MAINT switch to OFF.
43. Remove the boresight telescope from antenna.
Reinstall caplug in front of radome.
44. Cage the M61 sight and set SYSTEM POWER switch to OFF.
45. Recheck that there is nothing in the cannon muzzle.
46. Place NORM-STATIC-TEST switch to NORM and install arming connector.

CAUTION

Do not remove the night sight lens cover in the daylight. Never let the sun shine directly into the lens.

47. If AN/TVS-2B or AN/TVS-5 night sight is to be used, install it according to page 2-76 or 2-76.1.

48. Position cannon so that cross of M134 reticle is centered on distant aiming point.

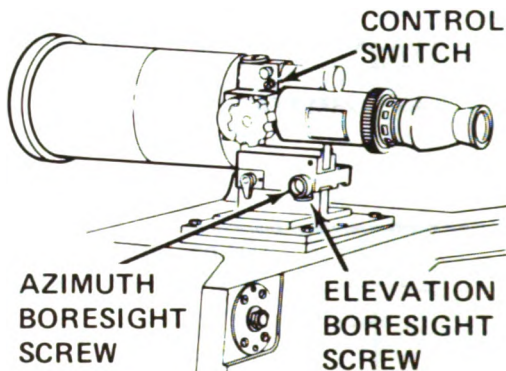


BORESIGHTING, DISTANT AIMING POINT METHOD - CONTINUED

49. Turn night sight control switch to sight and reticle position. Open small aperture in lens cover.

CAUTION

Do not allow sun to shine directly into the aperture.

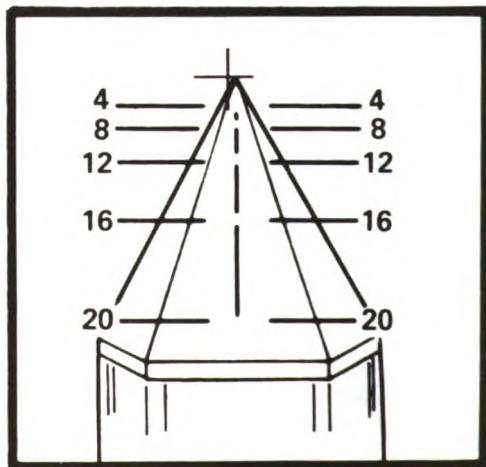


50. Look through night sight and turn azimuth and elevation adjusting screws to center cross of reticle on the distant aiming point.

51. Close aperture and turn night sight control switch to off position.

WARNING

A residual charge of approximately 45,000 volts exists after power is turned off. Always wait five minutes after shutdown before removing battery.



BORESIGHTING

BORESIGHTING, TARGET METHOD

3-16. Use this method when visibility is limited (under 2500 meters).

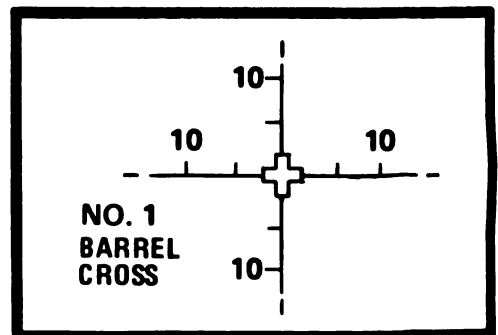
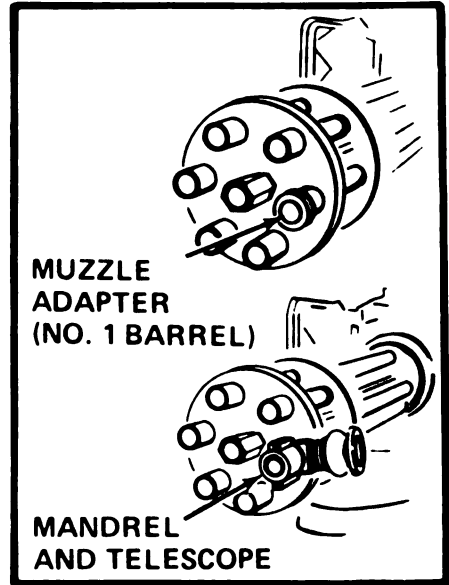
- 1. Using boresight target kit (5911308), choose a level, unobstructed area for boresighting.**
- 2. Set GUN POWER switch to OFF and NORM-STATIC-TEST switch to NORM.**
- 3. Remove arming connector from firing interrupter.**
- 4. Clear cannon - hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE position and rotate cannon barrels two complete revolutions. Remove any rounds in case chute.**

NOTE: In step 5, time the cannon without regard to the No. 1 barrel position if you are using a circular (ground role) muzzle clamp.

- 5. Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE, depress cannon index pin, and position No. 1 barrel in firing position at 4 o'clock as viewed from muzzle end. Release switch and index pin. Check that pin has returned to normal (out) position.**
- 6. Set SYSTEM POWER to ON and MODE switch to RADAR.**
- 7. Train cannon towards proposed target location and position at approximately 0 mils elevation.**
- 8. Position target 34 paces (approximately 25 meters) from muzzle of cannon. Check that target is level and as square as possible with cannon, and that No. 1 barrel aiming point on target is approximately same height as cannon.**

BORESIGHTING, TARGET METHOD - CONTINUED

9. Set distribution box **NORM-STATIC-TEST** switch to **STATIC**. Set **SYSTEM POWER** to **OFF**.
10. Set stow control **MODE** switch to **NORMAL** and **MAINT** switch to **ON**.
11. Insert muzzle adapter from boresight kit into muzzle of No. 1 barrel (4 o'clock position when viewed from muzzle end).
12. Make sure mandrel and boresight telescope are properly assembled, then insert the assembly into the muzzle adapter with eyepiece in horizontal position. Press mandrel assembly and adapter tightly into muzzle.
13. Release elevation and azimuth drive motor brakes.
14. Hold cannon down and to left. Sight through the telescope and line up crosshairs with the **NUMBER 1** barrel cross on the boresight target. Lock the elevation and azimuth drive motor brakes and check to make sure the **NUMBER 1** barrel cross is still at the crosshairs. If not, unlock, reposition and lock.
15. Hold cannon up and to the right. Sight through boresight telescope to determine if crosshairs are displaced less than 4 mils (in either azimuth or elevation) from the No. 1 barrel cross. If displaced more than 4 mils, discontinue procedure and notify organizational maintenance.



BORESIGHTING, TARGET METHOD - CONTINUED

16. Rotate mandrel and telescope assembly 180 degrees to horizontal position on opposite side of barrel. Sight through telescope and determine if point originally sighted on is still at the crosshairs. If crosshairs are displaced over 5 mils from point sighted on, boresight kit is defective. If crosshairs are displaced less than 5 mils, continue to use the kit. Compensate for under 5 mil error by offsetting the crosshairs from aiming point by one-half of the error.

NOTE

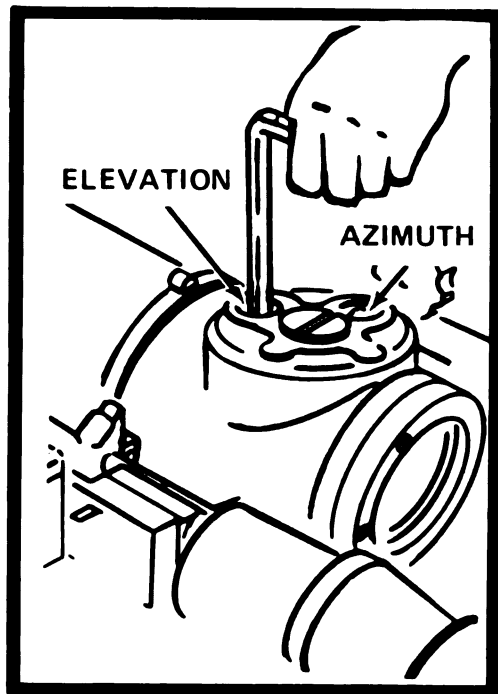
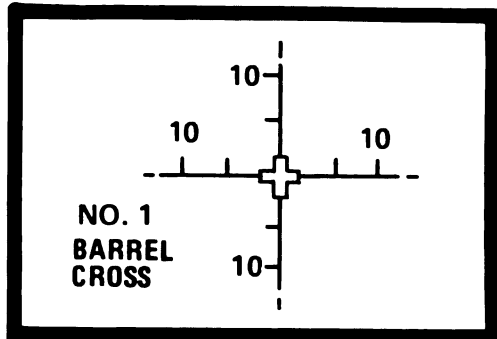
Before sighting at a fixed boresight target, always hold cannon down and to the left to compensate for system backlash.

17. Rotate boresight telescope and mandrel so that eyepiece is in vertical position. Unlock the elevation and azimuth drive motor brakes and manually position so that crosshairs of the telescope are 3.0 mils below and approximately 3.5 mils (plus any error compensation) to the right of the aiming point.
18. Lock the elevation and azimuth drive motor brakes and check that crosshairs haven't moved.

CAUTION

In the MAN, RADAR, EXT, or TEST modes, the M61 sight should not be mechanically uncaged until reticle illumination (approximately 10 seconds).

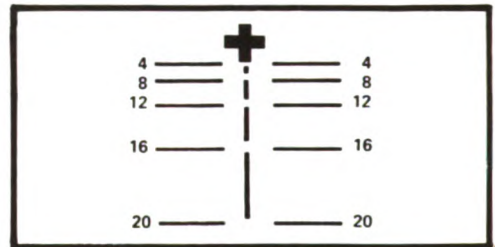
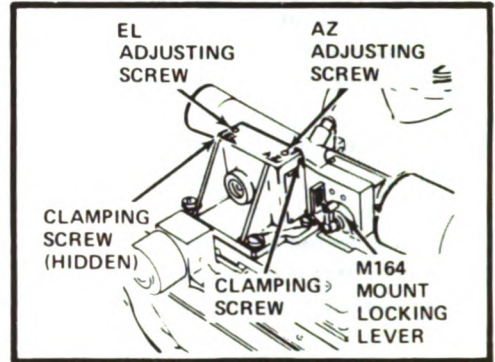
19. Set SYSTEM POWER to ON. Manually uncage the sight and adjust the control assembly SIGHT LAMP knob for a clear reticle in the sight.



20. Remove screw caps from the elevation and azimuth adjustment access holes on top of the sight. Do not disturb the third cap.
21. Have a second crewman look through the telescope as adjustments are being made to make sure that cannon does not move.

BORESIGHTING, TARGET METHOD - CONTINUED

22. As you make the following adjustments, move your eye up and down, right and left to minimize the apparent shifting of the target. Watch the sight reticle and turn elevation and azimuth adjustment bolts until the inner sight reticle is centered on the M61 SIGHT aiming circle.
23. Install the screw caps on the adjustment access holes.
24. If the M134 straight telescope is to be used, install it on the M164 mount according to page 2-33, and boresight it as follows:
25. Remove the lens cap from the M134 telescope. Loosen the elevation and azimuth clamping screws.
26. Look through the M134 telescope and adjust the azimuth and elevation adjusting screws until the cross in the reticle is aligned with the M134 telescope aiming cross on the target.
27. Tighten clamping screws and install lens cover.



- 27.1. If AN/TVS-2B or AN/TVS-5 night sight is to be used, install it according to page 2-76 or 2-76.1.
- 27.2. Position cannon so that cross of M134 reticle is aligned with the M134 telescope aiming cross on the target.

CAUTION

Do not allow sun to shine directly into the aperture.

- 27.3. Turn night sight control switch to sight and reticle position. Open small aperture in lens cover.
- 27.4. Look through night sight and turn azimuth and elevation adjusting screws to align the night sight reticle with the AN/TVS aiming cross.
- 27.5. Close aperture and turn night sight control switch to OFF position.

WARNING



A residual charge of approximately 45,000 volts exists after power is turned off. Always wait five minutes after shutdown before removing battery.

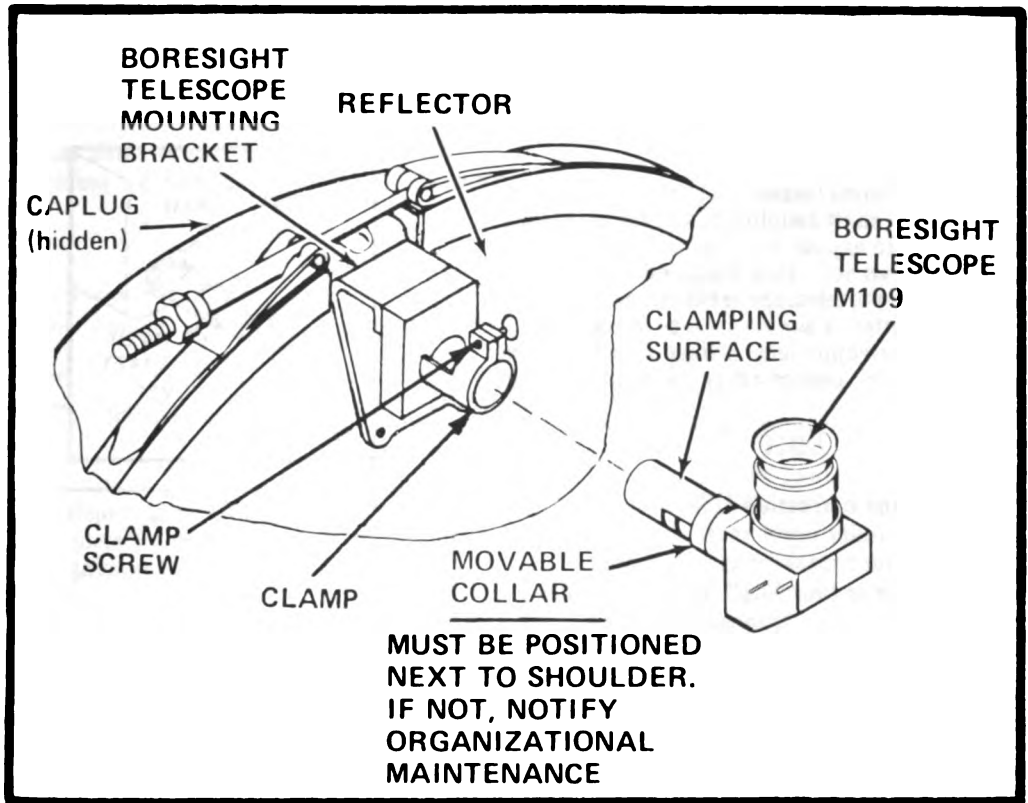
28. Remove boresight telescope and mandrel assembly from muzzle adapter.



WARNING

Be sure to remove muzzle adapter from cannon barrel.

BORESIGHTING, TARGET METHOD - CONTINUED



29. Remove telescope from mandrel assembly and install in the telescope mounting bracket on the antenna. Remove caplug from front of radome.
30. Use a second crewman to make sure that the M61 sight reticle is centered on the M61 SIGHT aiming circle before, during, and after the next adjustments.

IMPORTANT

Any pressure on antenna or telescope will
cause error.

BORESIGHTING, TARGET METHOD - CONTINUED

**WARNING**

Make slight adjustments when rotating elevation input shaft to avoid injury to personnel if antenna moves abruptly.

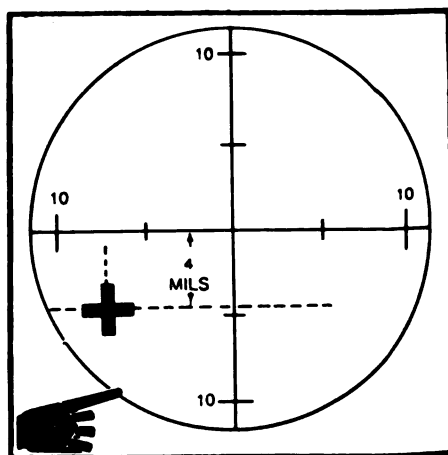
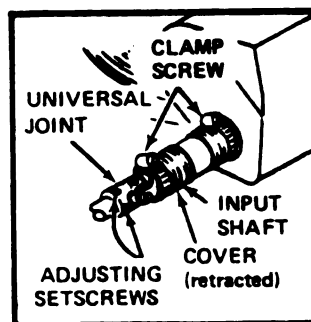


31. Loosen clamp screw located on gunner's side of elevation input shaft coupling to the radar antenna. Retract cover to expose universal joint setscrews. Loosen setscrews and rotate elevation input shaft to move boresight telescope reticle to position on the radar antenna aiming cross as indicated by the antenna correction label affixed to the antenna. Tighten setscrews, replace cover and tighten clamp screw.

NOTE

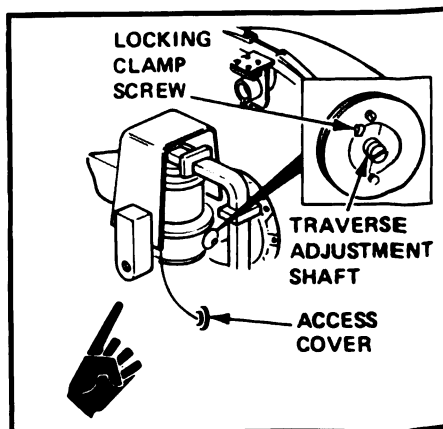
Sample antenna correction label below specifies that radar input shaft should be rotated until horizontal crosshair of bore-sight telescope is four MILS above the radar antenna aiming cross. If label is missing, notify organizational maintenance.

ANTENNA CORRECTIONS			
Set Horiz	Crosshair	<u>4</u>	Mils Above Aiming Point
Set Horiz	Crosshair	_____	Mils Below Aiming Point
Set Vert	Crosshair	_____	Mils Left of Aiming Point
Set Vert	Crosshair	<u>7</u>	Mils Right of Aiming Point

**NOTE**

A second crew member must check that the M61 sight reticle is centered on the M61 circle on the target.

32. Remove access cover from traverse adjustment shaft located on reflector and feed assembly. Loosen locking clamp screw and turn traverse adjustment shaft until verticle crosshair in bore-sight telescope reticle is positioned as indicated on the antenna correction label affixed to the antenna. Tighten locking clamp and replace access cover.



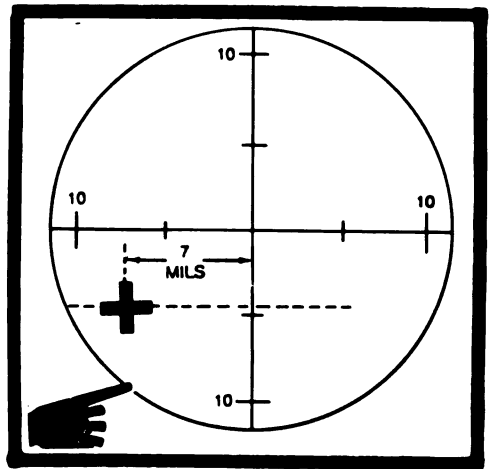
BORESIGHTING, TARGET METHOD - CONTINUED

NOTE

Sample antenna corrections label specifies that traverse adjustment shaft should be rotated until vertical crosshair on boresight telescope is seven mils to the right of the radar antenna aiming cross. If label is missing, notify organizational maintenance.

ANTENNA CORRECTIONS

Set Horiz Crosshair	4	Mils Above Aiming Point
Set Horiz Crosshair		Mils Below Aiming Point
Set Vert Crosshair		Mils Left of Aiming Point
Set Vert Crosshair	7	Mils Right of Aiming Point



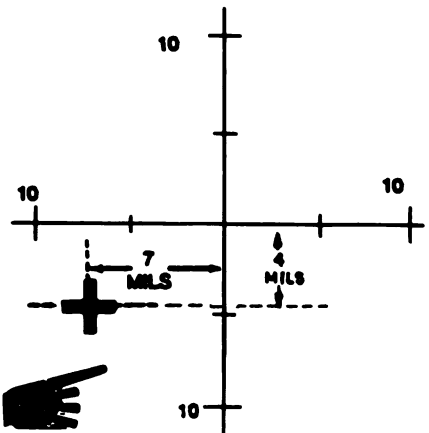
33. Repeat steps 30 and 31 if necessary to center boresight telescope crosshairs on the radar antenna target cross.

NOTE

If antenna does not respond in the following steps, notify organizational maintenance.

34. Repeat steps 30 and 31 if necessary to position the boresight telescope reticle crosshairs as indicated by antenna correction label.
35. Set stow control MODE switch to STOW.
36. Using STOW control TRAV switch, drive the antenna to the left approximately 10 degrees.
37. Place STOW control MODE switch to NORMAL. Antenna will reposition.
38. At the boresight telescope mounted on the antenna, observe that the crosshairs within the reticle are positioned as indicated by the antenna correction label.
39. Repeat steps 35 through 38, except in step 36 drive the antenna to the right.

40. Set STOW control MODE switch to STOW.
41. Using STOW control ELEV switch, drive the antenna up approximately 10 degrees.
42. Place STOW control MODE switch to NORMAL.
43. At the boresight telescope mounted on the antenna, observe that the crosshairs within the reticle are positioned as indicated by the antenna correction label.



44. Repeat steps 40 through 43, except in step 41 drive the antenna down approximately 10 degrees.

BORESIGHTING, TARGET METHOD - CONTINUED

NOTE

If antenna does not respond, in steps 35 through 46, notify organizational maintenance.

- 45. Set STOW control MAINT switch to OFF.
- 46. Remove the boresight telescope from the antenna.
Reinstall caplug in front of radome.
- 47. Cage the M61 sight.
- 48. Set SYSTEM POWER switch to OFF.
- 49. Assure there is nothing in the muzzle.
- 50. Place NORM-STATIC-TEST switch to NORM and reinstall arming connector.

CHANGING RADAR FREQUENCY

CHANGING RADAR FREQUENCY

3-17. To change the radar operating frequency, use the following procedure.

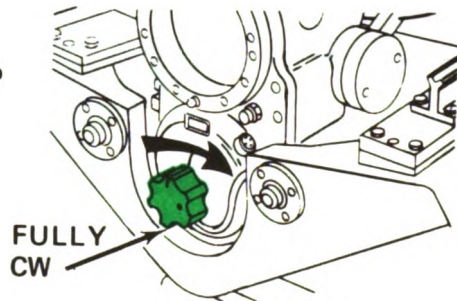
WARNING



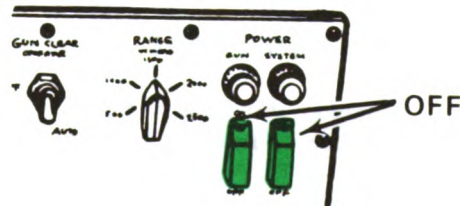
High voltage is present in receiver-transmitter when energized in standby or radiate condition. Death or injury can result from contact with this high voltage. Observe safety precautions.



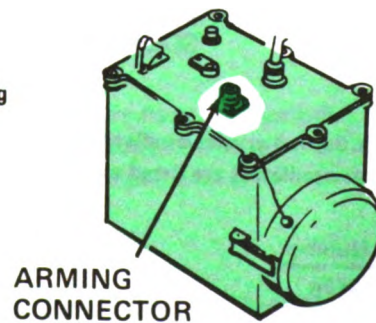
1. Turn knob on sight fully clockwise to cage sight.



2. Set control assembly GUN POWER and SYSTEM POWER switches to OFF.

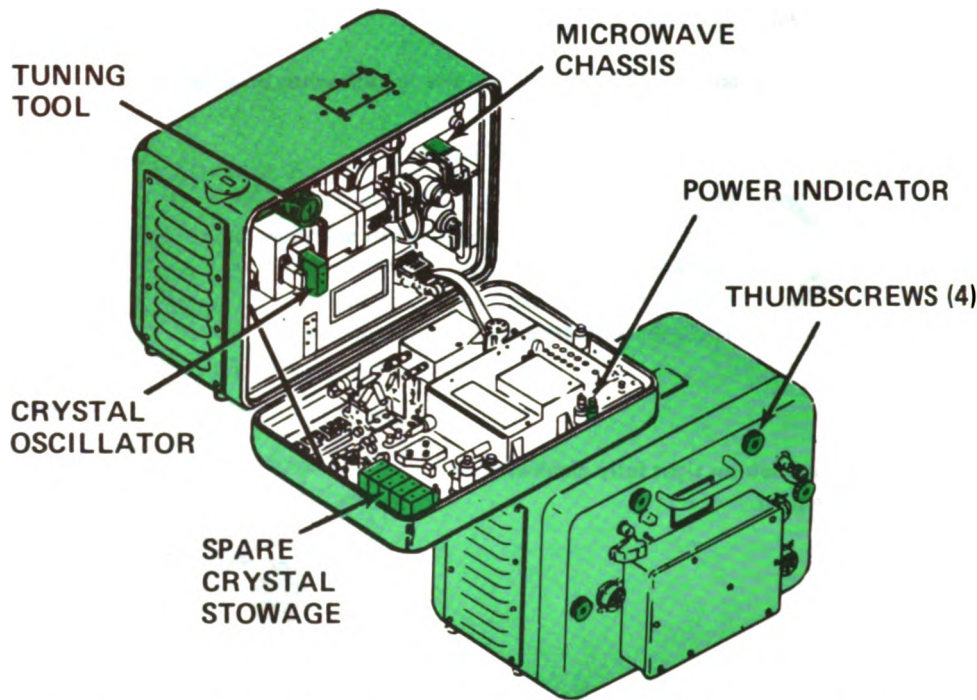


3. Remove arming connector from firing interrupter J2.

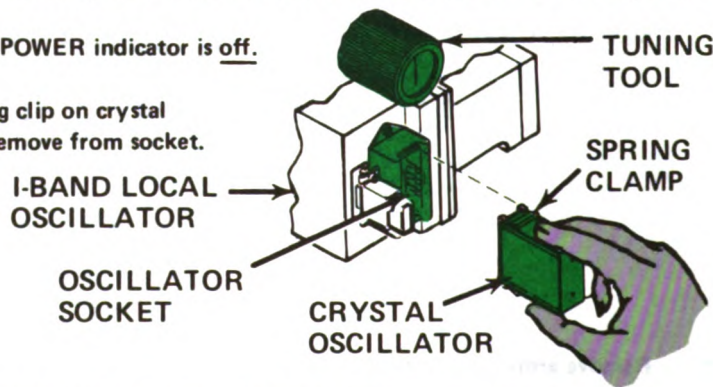


4. To gain access to receiver-transmitter remove quick-release fasteners and thumbscrews under baseplate, then remove cable guard.

CHANGING RADAR FREQUENCY CONTINUED



- 5. On receiver-transmitter, loosen four thumbscrew fasteners and lower front panel.
- 6. Make sure that POWER indicator is off.
- 7. Compress spring clip on crystal oscillator and remove from socket.



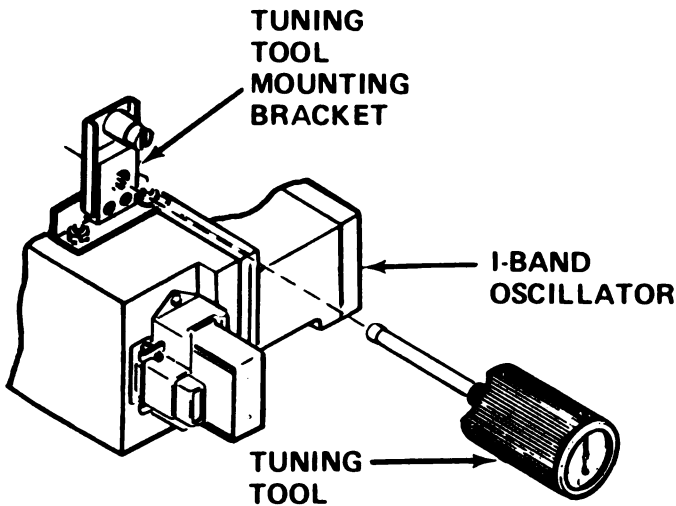
- 8. Select desired crystal oscillator from the spare crystals stowed in front panel. Crystal oscillators are listed as follows:

Part Number	Channel Number	Crystal Frequency (MHz)
10549175	1	9145
10549176	2	9153
10549177	3	9161
10549178	4	9169
10549179	5	9177
10548224	6	9185

CHANGING RADAR FREQUENCY - CONTINUED

NOTE: Each crystal oscillator is marked with its respective part number, channel number, and frequency.

9. Line up the selected crystal oscillator with the socket and install.
10. Stow the crystal oscillator that was removed in the front panel spare crystal stowage area.



11. Remove tuning tool from its mounting bracket by turning tool counterclockwise.
- 11.1. Insert tuning tool into frequency adjuster mounted in cover of unit 2. Push down on the indicator until the hand stops moving. The correct reading for proper adjustment is 6. If this reading is not obtained, discontinue the tuning procedure and notify organizational maintenance.

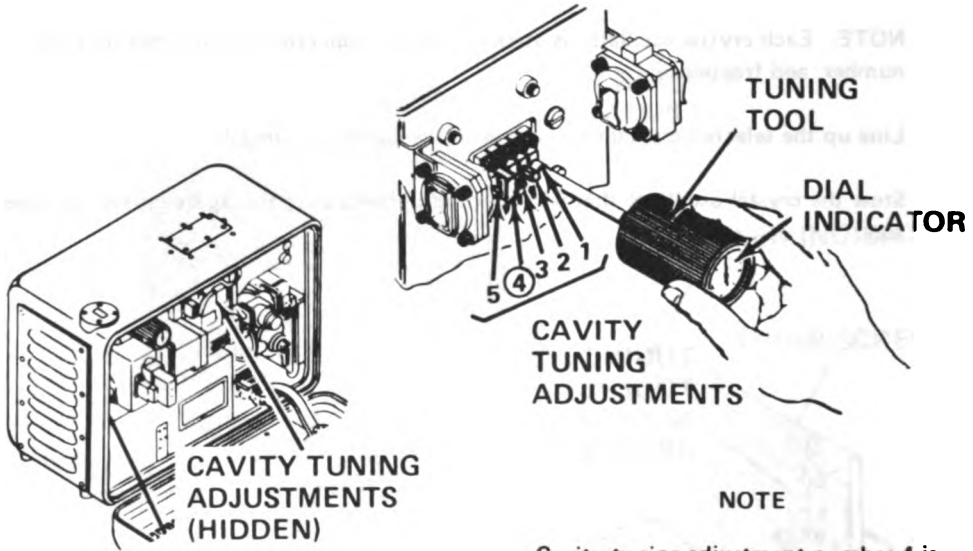
CAUTION

Turning the cavity adjustment screws hard against the stops will damage the klystron. Improper tuning of the klystron power amplifier can shorten the tube life.

NOTE

Clockwise movement of the tuning tool moves the indicator to lower frequencies. Counterclockwise movement of the tuning tool moves the indicator to higher frequencies.

CHANGING RADAR FREQUENCY - CONTINUED



NOTE

Cavity tuning adjustment number 4 is fixed-tuned.

12. Push in on the tuning tool, check position of indicator, and carefully adjust cavity tuning adjustment 1, 2, 3, and 5 until pointer on dial indicator is positioned to channel 3. Then adjust cavities 1, 2, 3, and 5 until indicator is positioned to new operating frequency. The klystron is now course-tuned to new operating frequency.

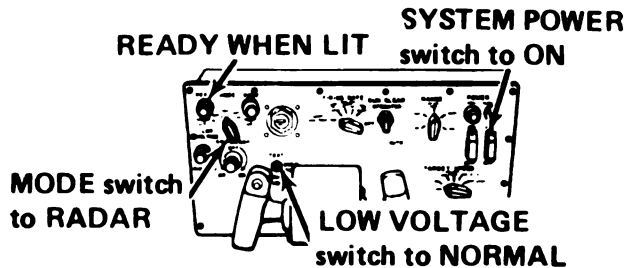


WARNING

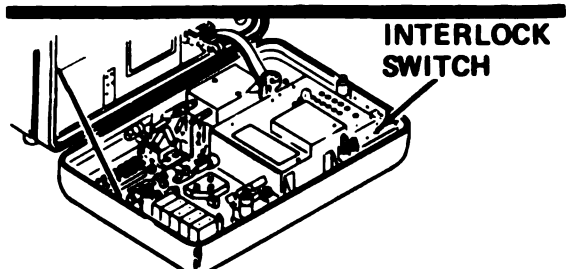
Be very careful during the following steps. High voltage will be present when the receiver-transmitter is energized.



13. Set control assembly **LOW VOLTAGE** switch to **NORMAL** and **SYSTEM POWER** switch to **ON**. Set **MODE** switch to **RADAR**.

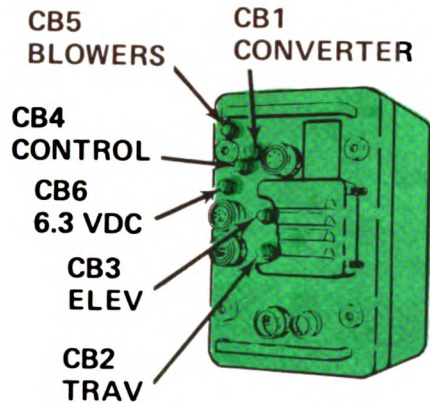


14. Pull receiver-transmitter interlock switch forward and out to service position. Receiver-transmitter is now energized. Wait until the **READY WHEN LIT** light goes on.

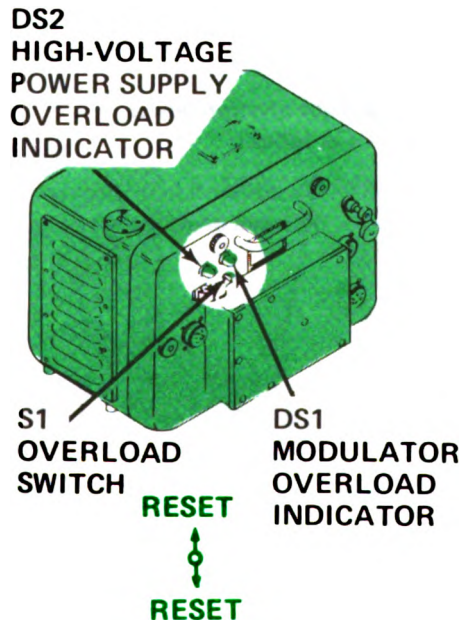
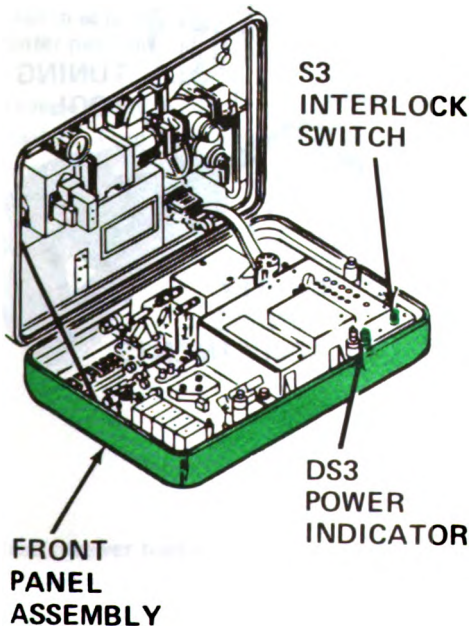


CHANGING RADAR FREQUENCY - CONTINUED

NOTE: If **READY WHEN LIT** indicator fails to light after two minutes $\pm$ 15 seconds, or if it goes out during operation, check all circuit breakers on power supply front panel. If a breaker has tripped, as indicated by an exposed white band on extended pushbutton shaft, reset the breaker. If the breaker trips immediately, do not reset it again. Notify organizational maintenance.



15. Check that receiver-transmitter **HIGH VOLTAGE SUPPLY OVERLOAD** and **MODULATOR OVERLOAD** indicators are not lit. If they are, momentarily set **OVERLOAD RESET** to ON to reset sensing circuit. If indicators continue to light, notify organizational maintenance.



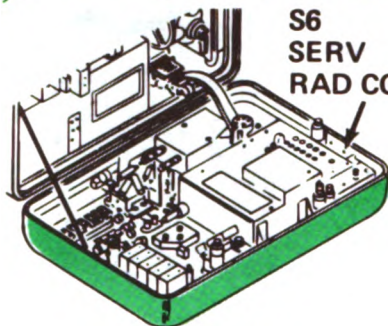
16. Deleted

CHANGING RADAR FREQUENCY- CONTINUED

WARNING



A potential radiation hazard exists when the radar antenna is energized. Keep everyone at least three feet away from front of the radiating feed horn in the antenna dish.



S6
SERV
RAD CONT

ON
⬇
OFF

NOTE

When radar is energized to radiate and either of the receiver-transmitter overload indicators light, momentarily set OVERLOAD RESET switch to RESET (to reset overload sensing circuit). Do not reset more than two times. If overload continues, notify organizational maintenance.

NOTE

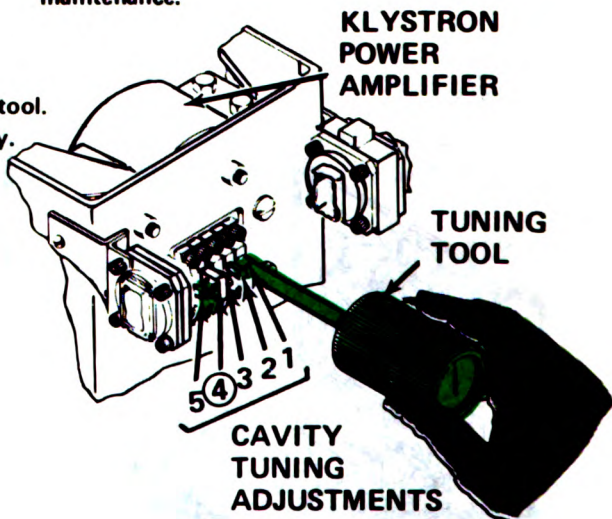
If HIGH VOLTAGE SUPPLY OVERLOAD and MODULATOR OVERLOAD indicators are not lit and the radar will not radiate, the +28 Vdc overload circuitry (light pipe) in the 2A2 may have tripped. To reset, turn SYSTEM POWER to OFF and then back ON. If radar will not radiate after two minutes, notify organizational maintenance.

CAUTION

Do not radiate at targets closer than 250 METERS. This will damage the radar.

17. Set SERV RAD CONT switch to ON. Radar is now energized to radiate.
18. Fine tune the klystron power amplifier as follows:

IMPORTANT: Do not push in on tuning tool. This can damage the cavity.



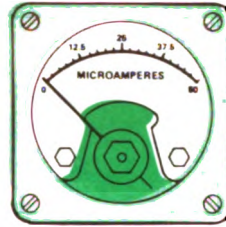
KLYSTRON
POWER
AMPLIFIER

TUNING
TOOL

CAVITY
TUNING
ADJUSTMENTS

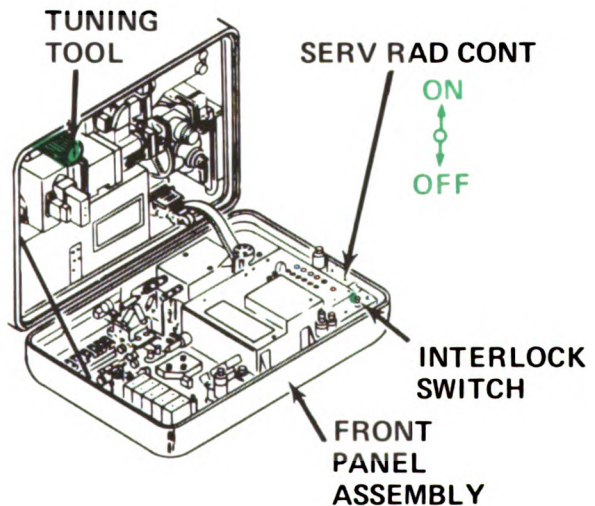
CHANGING RADAR FREQUENCY - CONTINUED

- (a) Watch the RF POWER meter on the micro-wave chassis and adjust cavity number 3 to obtain a peak reading.
- (b) Detune cavity number 3 by turning adjustment counterclockwise until RF POWER meter reading decreases to approximately 50 percent of step (a) peak reading.
- (c) Peak cavities 1, 2, and 5 respectively to their peak RF POWER meter reading.
- (d) Carefully tune cavity 3 clockwise for a peak RF POWER meter reading.
- (e) Deleted

**RF POWER METER**

NOTE Deleted

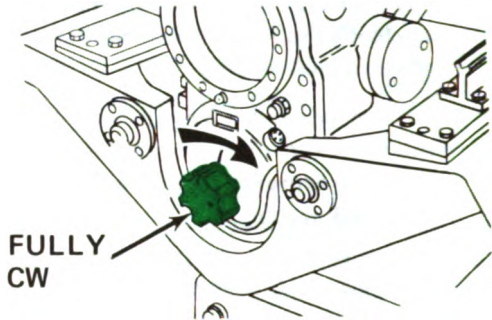
19. Set SERV RAD CONT switch to OFF.
20. Push in actuator of interlock switch to center position.
21. Replace tuning tool in mounting bracket. Turn tool clockwise until secure.



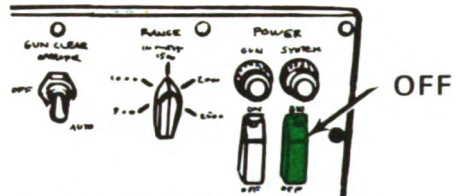
22. Raise receiver-transmitter front panel and secure with four thumbscrew fasteners. Place cable guard in place and secure with quick-release fasteners and thumb screws.

CHANGING RADAR FREQUENCY - CONTINUED

23. Make sure that the sight is caged.



24. Set SYSTEM POWER switch to OFF.
Install arming connector in firing interrupter J2.



25. **IMPORTANT:** Make sure that all the daily Preventive Maintenance Checks and Services (PMCS) have been performed before firing (page 3-3).

Section VI.

ROUND INTERVAL MAINTENANCE

3-18. Round interval preventive maintenance is based on the number of rounds cycled through the system, or fired through the system. Because of this, an accurate record must be maintained in the logbook of all rounds cycled, and all rounds fired.

3-19. Deleted.

Table 3-3. Deleted.

Section VII. TROUBLESHOOTING

3-20. This section provides information useful in troubleshooting. Notify organizational maintenance of any test or inspection for which no corrective action is given. Table 3-4 lists malfunctions, test or inspections, and corrective actions which you can perform. Tests or inspections should be checked in the order given. The following is a quick reference of symptoms covered in the table:

SYMPTOM INDEX

	Page		Page
<u>LOWER CARRIAGE</u>		<u>SIGHTING AND FIRE CONTROL</u>	
Hydraulic System –		Antenna –	
– Doesn't pump up	3-57	– Doesn't respond to positioning commands	3-66
UPPER MOUNT		Headset –	
Azimuth Drive –		– No audio tone during clutter lockon test	3-69
– Doesn't respond	3-59	GOOD WHEN LIT indicator –	
– Has uncontrolled response . .	3-60	– Doesn't light	3-69
Azimuth and Elevation Drives –		HIGH VOLTAGE POWER	
– Don't respond	3-58	SUPPLY OVERLOAD OR	
Elevation Drive –		MODULATOR OVERLOAD	
– Has uncontrolled response . .	3-60	INDICATORS light	3-68
LOW VOLTAGE WARNING		M61 Sight Reticle Light –	
indicator –		– Doesn't work	3-69
– Flashes or stays lit	3-59	Manual Mode –	
SYSTEM POWER indicator –		– No lead angle	3-64
– Doesn't work	3-58	– Improper lead angle	3-65
CANNON		POWER indicator in receiver-	
– Can't be rotated using BRAKE-CLEAR AND		transmitter	
BRAKE switch	3-61	– Doesn't light	3-68
– Doesn't rotate with SYSTEM POWER and		READY WHEN LIT indicator –	
GUN POWER on	3-62	– Doesn't light after SYSTEM POWER has been turned on for two minutes	3-65
– Doesn't clear	3-63	RF POWER indicator –	
– Misfires	3-64	– Doesn't light	3-67
– Has slow or erratic fire	3-64	RF Power Meter –	
GUN POWER indicator –		– Abnormal indication	3-68
– Doesn't work	3-60	SYSTEM POWER	
Rounds – Don't fire	3-63	– interrupted	3-69

Table 3-4. Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

NOTE

For corrective actions of malfunctions not listed in this table, notify organizational maintenance.

NOTE

Wherever the word lubricate appears, see LO 9-1005-286-13.

IMPORTANT

Malfunction of the mount can be due to a dead battery. A battery check should be part of any malfunction check-out where electric power is involved. Check to see if **LOW VOLTAGE WARNING** indicator is on, indicating fire control system power has been interrupted because of low voltage. The percentage load meter on the APU may also be used to determine the condition of the batteries. If batteries are discharged, they should be recharged following the procedure given on page 3-73.

IMPORTANT

Check that all cables are properly connected, secured, and undamaged.

1. LOWER CARRIAGE

(1) Hydraulic system fails to pump up.

→	Is fluid level low?	→	If so, add fluid. Refer to LO 9-1005-286-13.
→	Do hydraulic lines or connection leak?	→	If so, try to stop by tightening components. If leaks cannot be stopped by tightening, notify organizational maintenance.
→	Is pump valve rotated to DN position or not fully rotated to UP position?	→	If so, rotate fully clockwise to UP position.

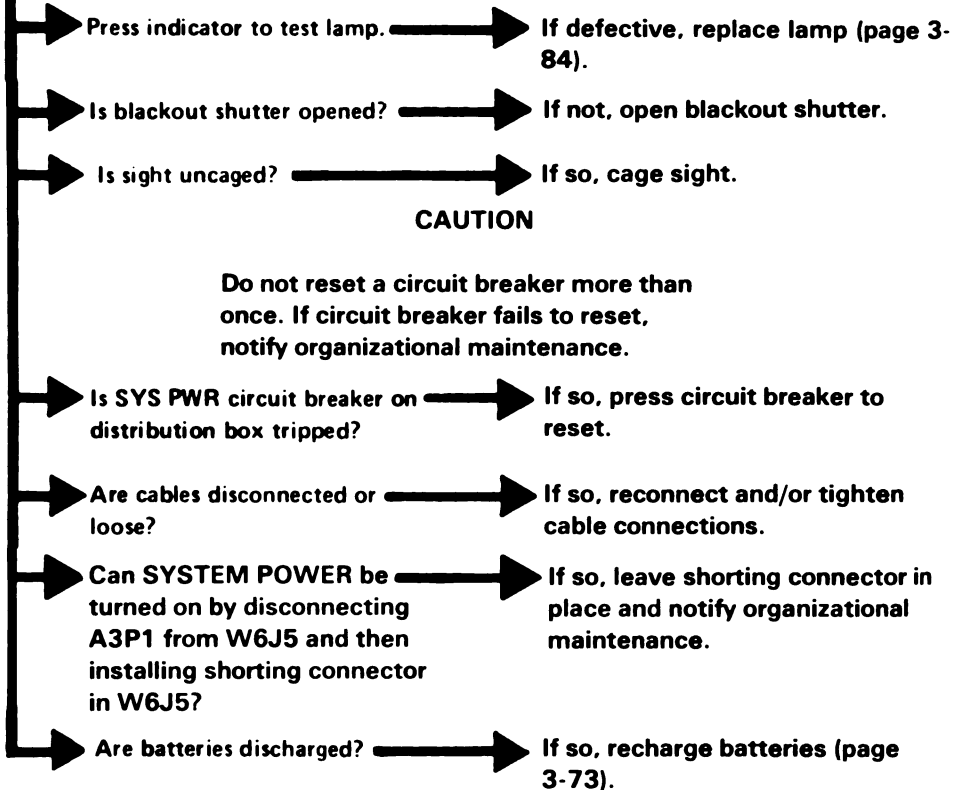
Table 3-4. Troubleshooting - Continued

MALFUNCTION



2. UPPER MOUNT

- (1) Control panel SYSTEM POWER indicator fails to light when SYSTEM POWER switch is set to ON position.



- (2) Both azimuth and elevation drives fail to respond when action switch is depressed and elevation and azimuth controls are rotated.

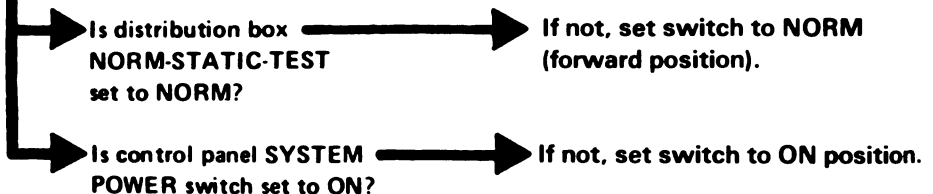


Table 3-4. Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. Upper Mount - Continued		
(3) LOW VOLTAGE WARNING indicator flashes or stays lit when LOW VOLTAGE switch is set to NORMAL.	Are batteries low?	If so, recharge batteries (page 3-73).
(4) Elevation drive responds when action switch is depressed but azimuth drive does not respond.	Are servo amplifier connectors loose or disconnected?	If so, connect or tighten.
	None	Disconnect W8P3 and W8P2 from A15A1 and A15A2. Reconnect W8P3 to A15A2 for possible operation at reduced slew speed. Notify organizational maintenance.

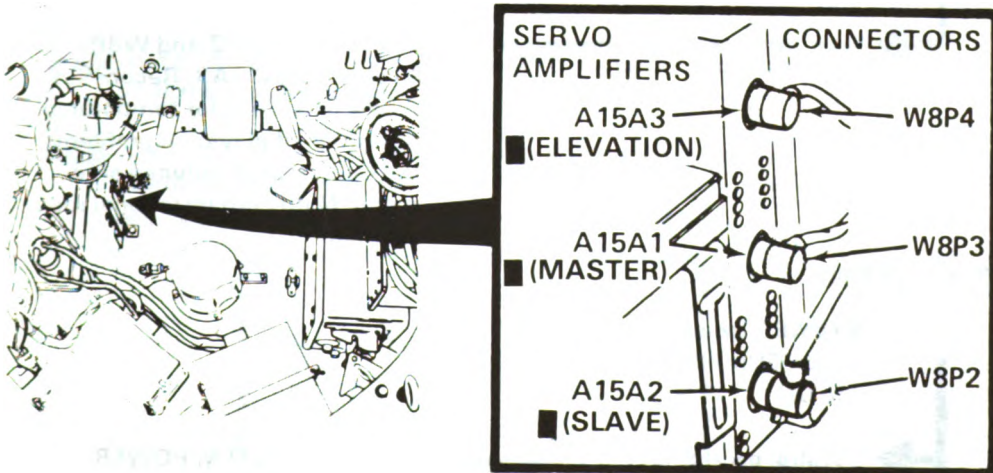


Table 3-4. Troubleshooting - Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

2. Upper Mount - Continued

- (5) Elevation drive responds when action switch is depressed but azimuth drive has uncontrolled response.

None

Disconnect W8P2 from A15A2. If malfunction still exists, disconnect W8P3 from A15A1 and reconnect to A15A2 for possible operation at reduced slew speed. Notify organizational maintenance.

- (6) Azimuth drive responds when action switch is depressed but elevation drive does not respond or has uncontrolled response.

Are servo amplifier connectors loose or disconnected?

If so, connect or tighten.

None

Disconnect W8P2 and W8P4 from A15A2 and A15A3. Reconnect W8P4 to A15A2 for temporary correction of elevation problem and operation at reduced slew speed. Notify organizational maintenance.

3. CANNON

- (1) GUN POWER indicator fails to light when GUN POWER switch is set to ON.

Is control panel SYSTEM POWER switch set to ON?

If not, set SYSTEM POWER switch to ON.

Press indicator to test lamp.

If defective, replace lamp (page 3-84).

Is blackout shutter opened?

If not, open blackout shutter.

Table 3-4. Troubleshooting - Continued

MALFUNCTION**TEST OR INSPECTION****CORRECTIVE ACTION****3. Cannon - Continued**

- (2) Gun cannot be rotated with **BRAKE-CLEAR AND BRAKE** switch set to **CLEAR AND BRAKE** position.

Are all bolt assemblies installed correctly (one per rotor track)?

If not, notify organizational maintenance.

Is indexing pin on cannon free?

If not, free indexing pin. Page 2-3.

Is indexing pin on feeder free?

If not, free indexing pin. Page 2-3.

Is cable to **BRAKE-CLEAR AND BRAKE** switch loose or disconnected?

If so, connect or tighten.

CAUTION

Do not reset a circuit breaker more than once. If circuit breaker fails to reset, notify organizational maintenance.

Is **SYS PWR** circuit breaker on distribution box tripped?

If so, press circuit breaker to reset.

Is **W3** cable on gun drive assembly and/or distribution box loose or disconnected?

If so, connect and/or tighten cable **W3** connectors (below). Page 3-62.

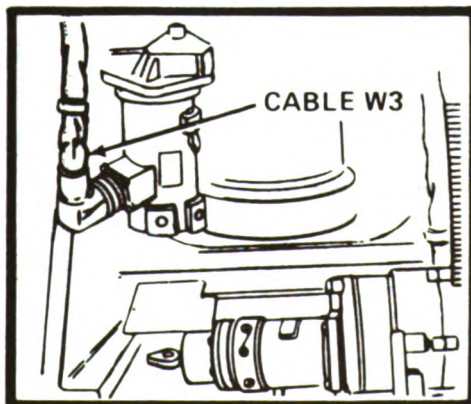
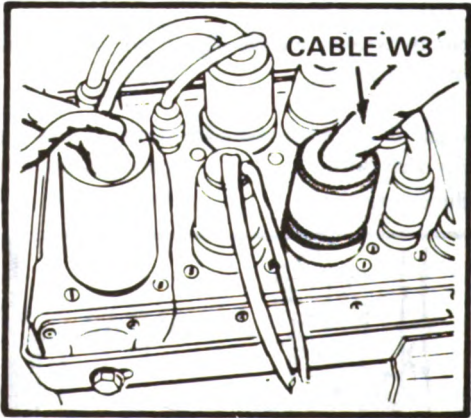
**GUN DRIVE ASSEMBLY**

Table 3-4. Troubleshooting - Continued

MALFUNCTION	
TEST OR INSPECTION	CORRECTIVE ACTION

3. Cannon - Continued

(3) SYSTEM POWER and GUN POWER indicators light but cannon fails to rotate.	
Is arming connector or arm-safe cable installed on firing interrupter?	If not, install arming connector or arm-safe cable on firing interrupter (page 2-8, 2-19).
Is arm-safe switch depressed (when used)?	If not, depress arm-safe switch (page 2-19).
Is W3 cable on gun drive assembly and distribution box loose or disconnected?	If so, connect and/or tighten cable W3 connectors (below) (page 3-61).



DISTRIBUTION BOX

Table 3-4. Troubleshooting - Continued**MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****3. Cannon - Continued****WARNING**

Clear cannon of all rounds before working on any part of firing mechanism. If cannon cannot be cleared, keep it positioned in a direction so that possible loss of life or damage to property will not result if ammunition cook-off should occur.



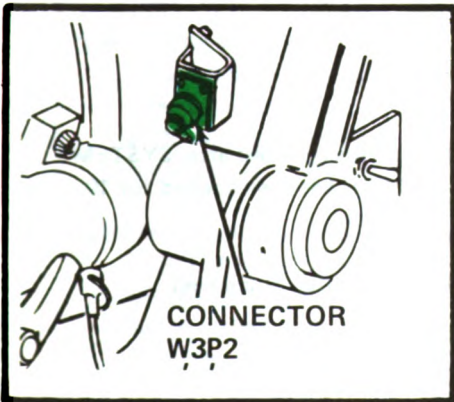
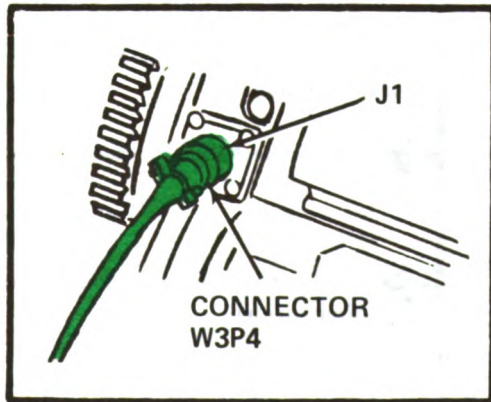
- (4) Cannon rotates, rounds feed through but do not fire.



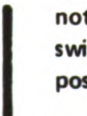
Is firing connector W3P2 connected to firing contact assembly?



If not, connect W3P2 to firing contact assembly.

**FIRING CONTACT ASSY****FEEDER CONNECTION**

- (5) Cannon fires normally but does not clear with GUN CLEAR switch in AUTO or OPERATOR position.



Is connector W3P4 connected to feeder?



If not, connect W3P4 to feeder connector J1.

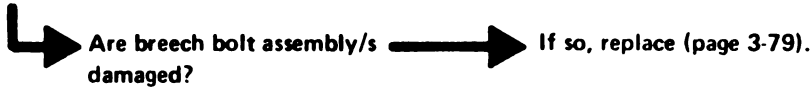
Table 3-4. Troubleshooting Continued

MALFUNCTION

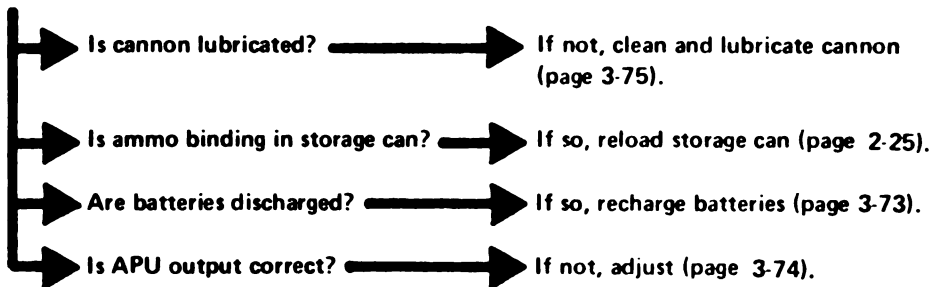


3. Cannon Continued

(6) Cannon misfires.

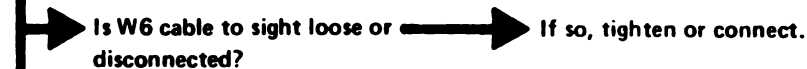
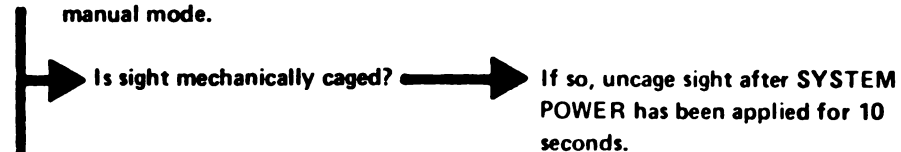


(7) Slow or erratic rate of fire.



4. SIGHTING AND FIRE CONTROL

(1) No lead angle is developed in manual mode.



CAUTION

Do not reset a circuit breaker more than once. If circuit breaker fails to reset, notify organizational maintenance.

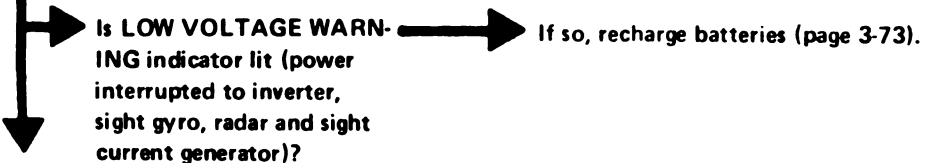


Table 3-4. Troubleshooting Continued

MALFUNCTION

→ **TEST OR INSPECTION** → **CORRECTIVE ACTION**

4. Sighting and Fire Control Continued

→ **Was sight left uncaged when SYSTEM POWER was turned ON (power interrupted to inverter, sight gyro, radar, and sight current generator)?** → **If so, recage sight and turn SYSTEM POWER OFF. Turn SYSTEM POWER ON and wait 10 seconds, then uncage sight.**

(2) Improper lead angle developed in manual mode.

→ **Is MODE switch on stow control set to NORMAL?** → **If not, set MODE switch to NORMAL.**

→ **Are SCG PWR, INVERTER PWR, and/or SIGHT GYRO PWR circuit breakers on system distribution box tripped?** → **If so, press circuit breakers to reset.**

→ **Is LOW VOLTAGE WARNING indicator lit (power interrupted to inverter, sight gyro, radar and sight current generator)?** → **If so, recharge batteries (page 3-73).**

→ **Was sight left uncaged when SYSTEM POWER was turned ON (power interrupted to inverter, sight gyro, radar, and sight current generator)?** → **If so, recage sight and turn SYSTEM POWER OFF. Turn SYSTEM POWER ON and wait 10 seconds, then uncage sight.**

(3) In radar mode, READY WHEN LIT indicator fails to light within 2 minutes $\pm$ 15 seconds after SYSTEM POWER switch is set to ON.

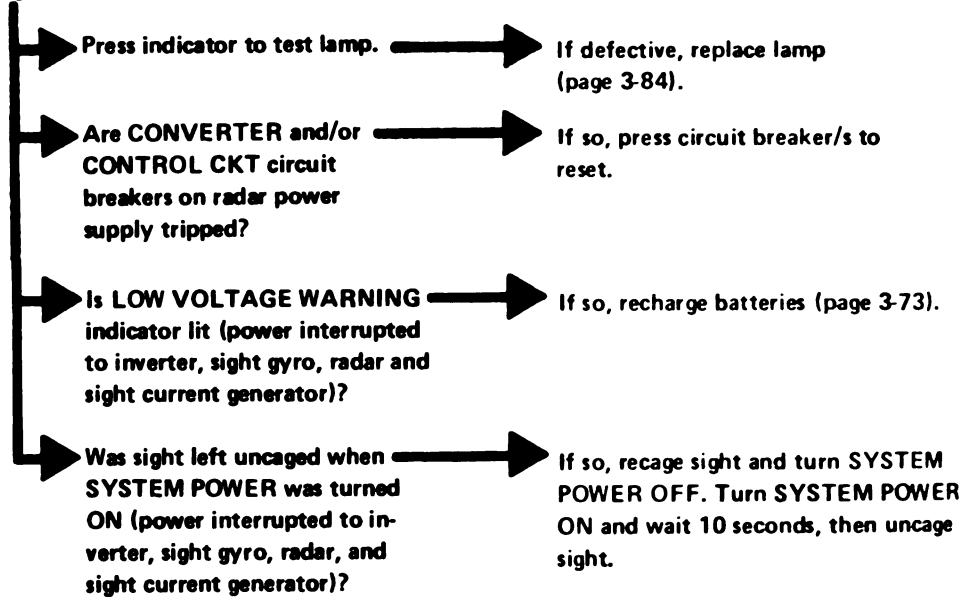
→ **Is cover on radar receiver-transmitter securely closed?** → **If not, close cover and tighten thumbscrews.**

Table 3-4. Troubleshooting - Continued

MALFUNCTION

TEST OR INSPECTION → CORRECTIVE ACTION

4. Sighting and Fire Control - Continued



(4) Antenna does not respond to positioning commands.

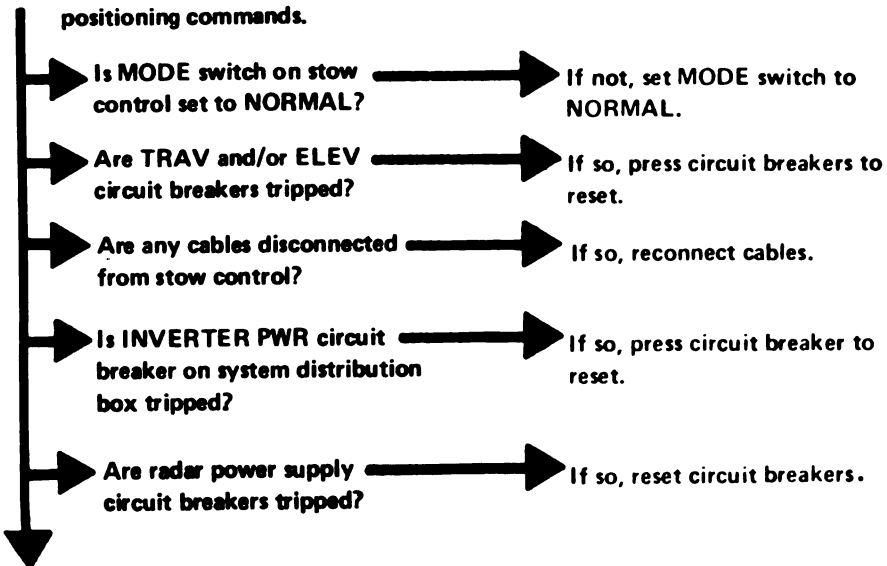


Table 3-4. Troubleshooting - Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

4. Sighting and Fire Control - Continued

Is **LOW VOLTAGE WARNING** indicator lit (power interrupted to inverter, sight gyro, radar and sight current generator)?

If so, recharge batteries (page 3-73).

Was sight left uncaged when **SYSTEM POWER** was turned **ON** (power interrupted to inverter, sight gyro, radar, and sight current generator)?

If so, recage sight and turn **SYSTEM POWER OFF**. Turn **SYSTEM POWER ON** and wait 10 seconds, then uncage sight.

(5) No indication on RF POWER meter when footswitch is pressed in RADAR mode.

If **MOD** or **HIGH VOLTAGE** overloads are not lit, the +28 Vdc overload circuitry (light pipe) in the 2A2 may have tripped.

Turn **SYSTEM POWER** to **OFF** and then back **ON**. If radar will not radiate after two minutes, continue to troubleshoot.

CAUTION

Do not attempt to reset **OVERLOAD** switch with footswitch depressed; damage to radar will result.

Is **OVERLOAD RESET** switch on radar receiver-transmitter tripped?

If so, reset **OVERLOAD RESET** switch.

Are one or more circuit breakers on radar power supply tripped?

If so, press circuit breaker/s to reset.

Deleted

Is klystron power amplifier tuned properly (low output)?

Check klystron power amplifier tuning (page 3-47).

Table 3-4. Troubleshooting Continued

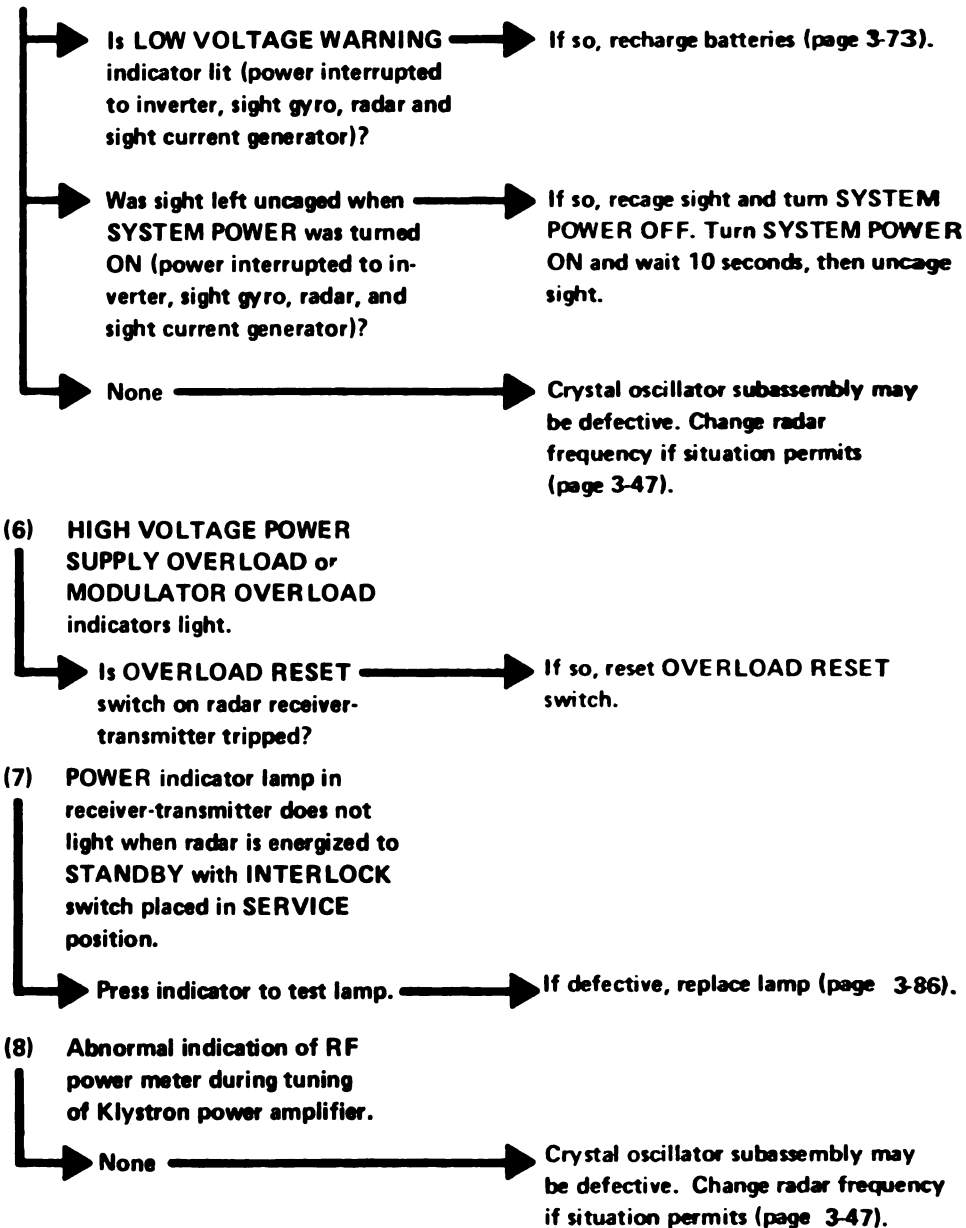
MALFUNCTION**TEST OR INSPECTION****CORRECTIVE ACTION****4. Sighting and Fire Control Continued**

Table 3-4. Troubleshooting - Continued

MALFUNCTION**TEST OR INSPECTION****CORRECTIVE ACTION****4. Sighting and Fire Control - Continued**

- (9) **GOOD WHEN LIT indicator fails to light during sight current generator test.**

Is cannon positioned at 0° elevation?

If not, position cannon at 0° elevation.

Are AIR DENSITY or MUZZLE VELOCITY knobs set properly?

If not, set knobs properly (page 2-28, 2-29).

Is radar antenna aligned with gun?

If not, set stow control MODE switch to NORMAL or boresight antenna.

Press indicator to test lamp.

If defective, replace lamp (page 3-84).

- (10) **M61 sight reticle lamp does not light.**

Is cable connection loose?

If so, tighten cable connector.

Is INVERTER PWR circuit breaker on system distribution box tripped?

If so, press circuit breaker to reset.

- (11) **Unable to obtain audio tone during clutter lockon test.**

None

Replace headset.

- (12) **Power to inverter, sight gyro, radar, and sight current generator cannot be restored by caging sight before turning SYSTEM POWER ON.**

Can SYSTEM POWER be turned on by disconnecting A3P1 from W6J5 and then installing shorting connector in W6J5?

If so, leave shorting connector in place and notify organizational maintenance.

Section VIII.

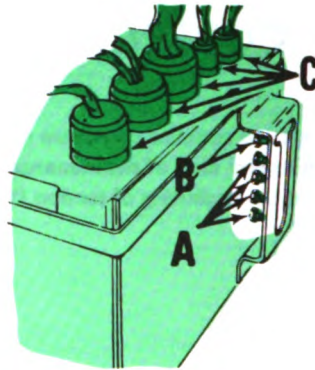
CORRECTIVE MAINTENANCE

3-21. This section contains corrective maintenance procedures that you can perform. When performing any kind of maintenance, always observe the applicable general procedures given at the beginning of section IV, page 3-4.

DISTRIBUTION BOX

Inspection

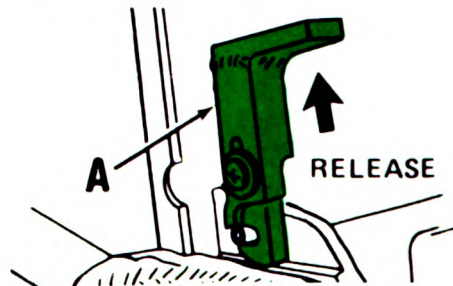
- Check box for secure mounting. Check for tripped or damaged circuit breakers (A).
- Check switch (B) for proper operation. Check connectors (C) for proper installation and security.



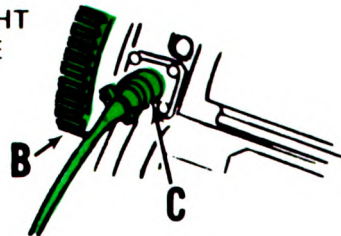
DECLUTCHING FEEDER

Inspection

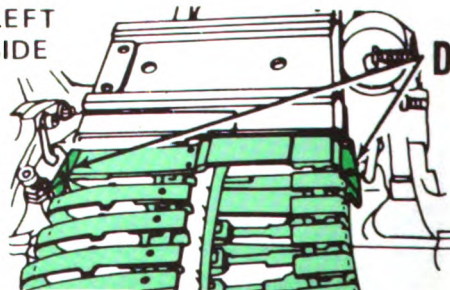
- Remove two front quick release pins and release two rear latches (A) on gun shield. Remove gun shield. Check latches for damage or looseness.
- Check all visible gears (B) for burrs, nicks, or missing teeth.
- Disconnect cable (C) and check plug and receptacle for corrosion, alignment, and cracked inserts.
- Check cable for abraded insulation and reconnect cable.
- Check feed chute clips for serviceability (D).
- Check for broken safety wire on feeder mounting pins.
- Install gun shield.



RIGHT SIDE



LEFT SIDE

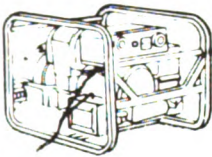


BATTERIES

BATTERIES

WARNING

1. **DON'T** handle ammunition when servicing batteries.
2. **DON'T** smoke when servicing batteries.
3. **DON'T** drop any tools across batteries.
4. **DON'T** wear rings, watches, bracelets, or I.D. tags when servicing batteries.



IMPORTANT — Most battery servicing is done by organizational maintenance with crew assistance. Servicing by crew is limited to charging, and inspecting for cleanliness, damage, and that cable connections are secure.

CHARGING BATTERIES

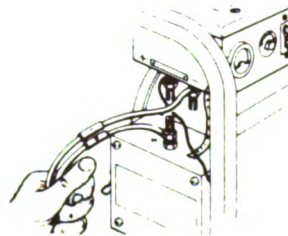
WARNING



Do not operate APU until you are familiar with operating procedures in TM 5-6115-323-14. The APU produces ample electrical power to cause injury if normal safety precautions are not observed.



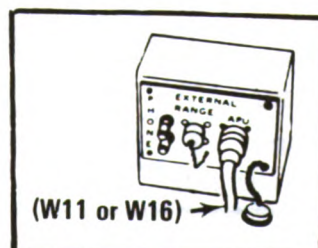
Make sure lead from circuit protector to positive (+) terminal of control box is connected securely. Connect APU power cable W11 or W16 to **LOAD TERMINALS** on APU. Make sure that W11 or W16 cable lead marked negative (-) is connected to the negative terminal on DC control box and that cable lead marked (+) is connected to terminal on circuit protector box.



NOTE

Be sure keys are aligned when installing cable.

Connect other end of power cable to APU receptacle on the service panel. Start APU and adjust controls according to page 2-77.



BATTERIES - CONTINUED

CAUTION Do not allow VOLTS meter to exceed 28.7 volts or PERCENT LOAD CURRENT meter to exceed 100 percent when charging batteries or damage may result.

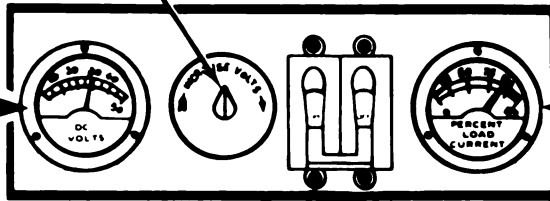
CAUTION If outside temperature is above 80°F, charging voltage should be set at 27.5 V dc. If temperature is below 80°F, charging voltage should be set at 28.7 V dc.

WHEN CHARGING ADJUST APU CONTROL PANEL FOR—

START

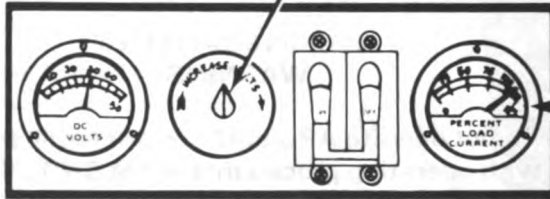
ADJUST

**27.5 TO
28.7**



**LESS
THAN 100**

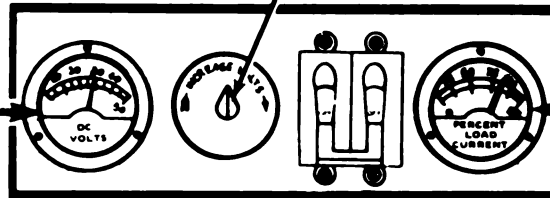
ADJUST UNTIL UNDER 100



IF OVER 100

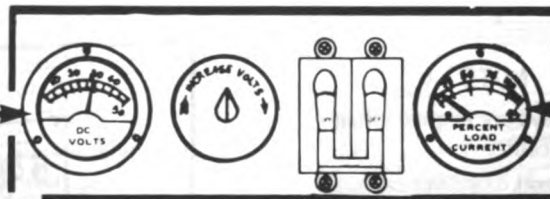
READJUST AS LOAD METER DROPS

**NOT OVER
28.7**



**NOT
OVER 100**

**27.5 TO
28.7**



10 OR LESS

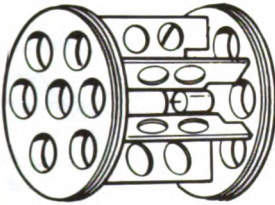
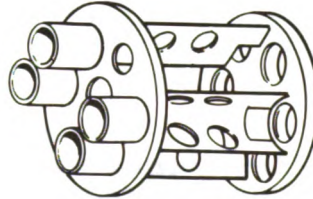
**FINISHED
(batteries charged)**

CAUTION If meter does not show 10 or less after 30 minutes, discontinue charging and notify organizational maintenance.

M168 CANNON

Removal, cleaning, inspection and installation of muzzle clamp assembly, center clamp assembly and barrels.**Removal.****NOTE**

There are two muzzle clamps. An elliptical, 6 X 18 mil clamp holds the barrels in a slightly elliptical configuration; the other, a circular 5 mil clamp, holds the barrels in a round configuration.

**CIRCULAR 5 MIL CLAMP****ELLIPTICAL 6X18 MIL CLAMP (OVAL)**

- Verify that GUN POWER and SYSTEM POWER switches are in their OFF positions.

**WARNING**

Clear cannon. Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE and rotate cannon barrels two complete revolutions.

**CAUTION**

Don't hold switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

CAUTION

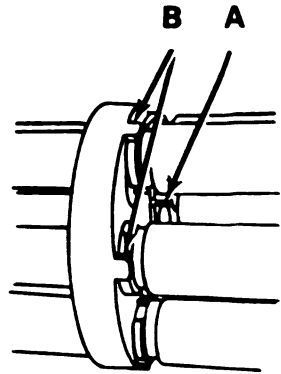
Don't use timing pin to lock barrel cluster while loosening muzzle clamp bolt.

M168 CANNON — CONTINUED

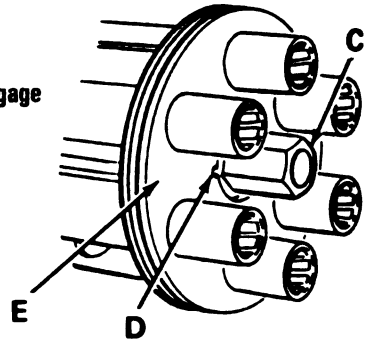
- Place distribution box NORM-STATIC-TEST switch at **STATIC** position (center), and verify that arming connector is disconnected from firing interrupter.

- Remove cotter pin (A) from center clamp (B) and rotate locking disc in clockwise direction (as seen from muzzle) until it disengages barrels.

- Drive center clamp forward approximately 12 inches.



- Loosen muzzle clamp locking bolt (C) and disengage locating pin or triangular locking plate (D) from hole in front plate.



- Rotate triangular locking plate counterclockwise (as seen from muzzle) until it is free of barrels, and remove muzzle clamp (E).

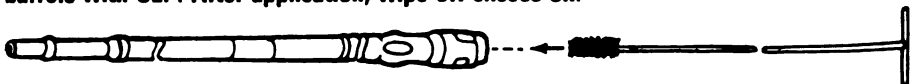
CAUTION

Assure that at no time barrels from one cannon are interchanged with barrels from another cannon.

- Twist each barrel approximately 60 degrees in either direction, and pull out of cannon rotor.

Cleaning.

- **Barrels.** Clean barrels from breech end. Clean all powder-fouled surfaces using cleaning staff and hore brush saturated with cleaner, lubricant (CLP) (item 3, appendix D). Wipe dry, coat inside and outside surfaces of cannon barrels with CLP. After application, wipe off excess oil.



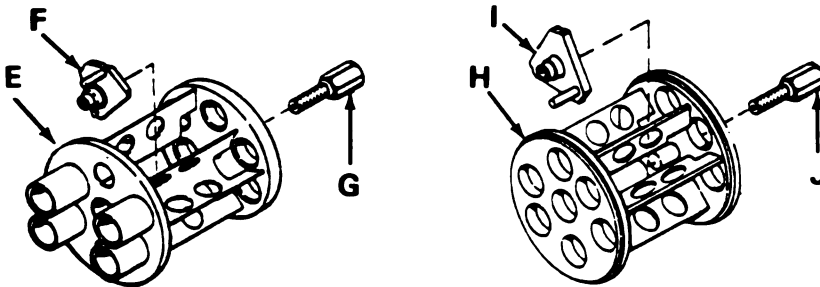
M168 CANNON – CONTINUED

- Muzzle clamps and center barrel clamp. Clean all exposed surfaces with cleaner, lubricant (CLP) (item 3, appendix D). Wipe dry, coat all surfaces with CLP. After application, wipe off excess oil.

Inspection.

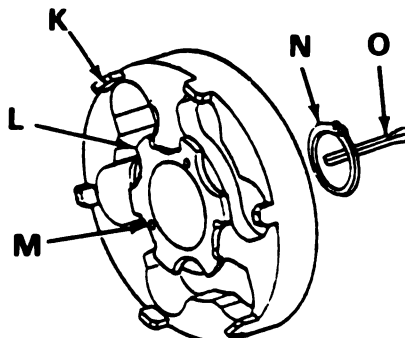
- Inspection of muzzle clamp assembly. Inspect the muzzle clamp assembly for the presence of any of the following conditions. Notify organizational maintenance if defects are found.

- Damaged clamp or broken welds (E & H).
- Damaged threads on bolt (G & J).
- Damaged threads or lugs on locking plate (F & I).
- Bent or missing pin on triangular locking plate (F & I).
- Defective self-locking feature of triangular locking plate (F & I).



- Inspection of center clamp assembly. Inspect the center clamp assembly for the presence of any of the following conditions. Notify organizational maintenance if defects are found.

- Bent or damaged barrel locking lugs on outer plate (K).
- Defective locking feature of locking disc (L).
- Missing or damaged spring pin (M).
- Cracked or damaged locking disc (L).
- Missing or damaged retaining ring (N).
- Missing or damaged cotter pin (O).



M168 CANNON — CONTINUED

- Inspection of barrels. Check for cracks and bulges, damaged locking lugs or flanges. Notify organizational maintenance if defects are found.

Installation of barrels, center clamp and muzzle clamps for air defense (AD) and ground role (G):

AD&G —Set control assembly GUN POWER switch to OFF.

WARNING



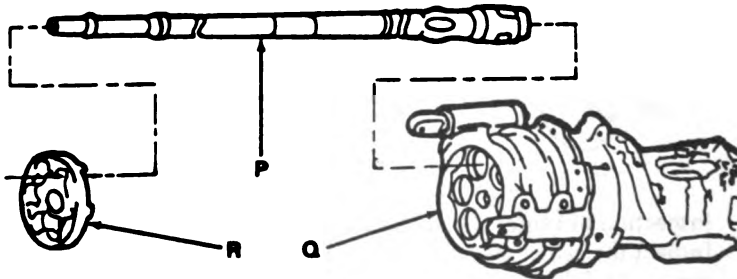
Clear cannon. Hold BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE and rotate cannon barrels two complete revolutions.



CAUTION

Don't hold switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

AO&G — Place each barrel (P) in rotor (Q) until they hit a positive stop and twist barrel approximately 60 degrees in either direction.



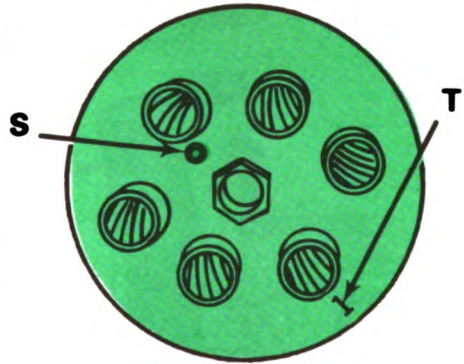
AD&G Position the center clamp (R) on barrels and slide it to within approximately one inch of its normal location on barrels. Twist each barrel to line up slot on barrel with barrel locking lugs on center clamp. Then slide center clamp forward approximately twelve inches, being careful not to change position of barrels.

M168 CANNON – CONTINUED

- AD** – Time cannon. Hold **BRAKE-CLEAR AND BRAKE** switch to **CLEAR AND BRAKE** position. Depress cannon timing pin and rotate cannon until timing pin engages. Release **CLEAR AND BRAKE** switch and timing pin. Check that timing pin is disengaged.

- AD&G** – Position muzzle clamp triangular locking plate so that pin is slightly to right of locating hole (S) in muzzle clamp.

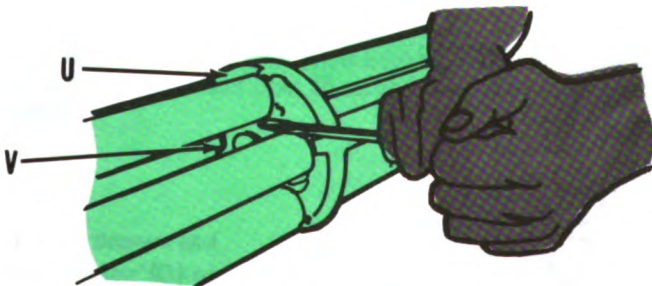
- AD** – Place muzzle clamp on barrels so that the **NO. 1 (T)** on muzzle clamp is located at barrel in the four o'clock position (in line with firing contact) as viewed from the muzzle.



- AD&G** – Slide muzzle clamp rearward until it hits a positive stop. Care should be taken so that position of barrels is not changed.

- AD&G** – Rotate muzzle clamp triangular locking plate clockwise until pin on locking plate is aligned with locating hole in front plate of muzzle clamp. Assure that triangular locking plate engages rear sides of barrel flanges.

- AD&G** – Slide center clamp (U) in position, turn locking disc (V) counterclockwise (as viewed from muzzle) until it reaches the locked position (holes in locking disc and clamp body aligned). Install cotter pin.

**CAUTION**

Do not use any auxiliary means of retaining cannon to reach torque requirement. Tighten against the gun drive motor brakes only.

- AD&G** – Torque muzzle clamp bolt to 600-650 in-lb.

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M168 CANNON — CONTINUED

Breech bolt removal**WARNING**

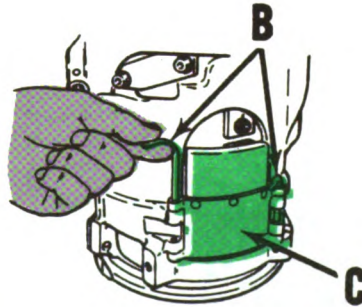
Make sure the cannon is clear and **SYSTEM POWER** and **GUN POWER** switches are **OFF** before performing the following procedure.



- Remove two front quick release pins and release two rear latches (A) on gun shield. Remove gun shield, then manually elevate cannon to maximum elevation.

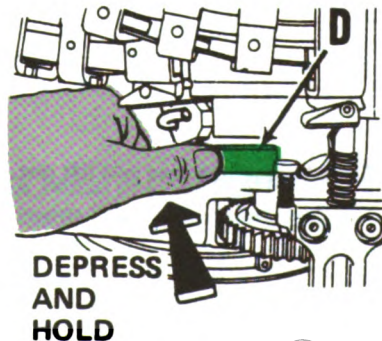


- Set elevation drive motor brake to **ON**.
- Pull two bolt access cover pins (B) and remove bolt access cover (C).

**CAUTION**

Don't hold **BRAKE-CLEAR AND BRAKE** switch in **CLEAR AND BRAKE** position longer than 10 seconds during any 1 minute interval.

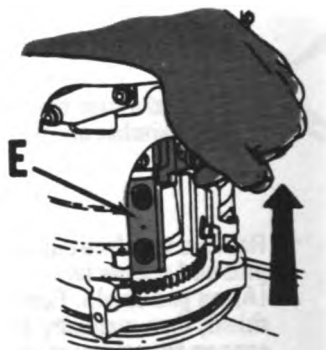
- Have a second man depress and hold clearing cam sector (D) on cannon, and set **BRAKE-CLEAR AND BRAKE** switch to **CLEAR AND BRAKE** on your command.



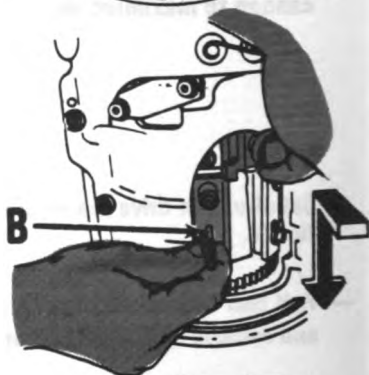
**DEPRESS
AND
HOLD**

M168 CANNON — CONTINUED

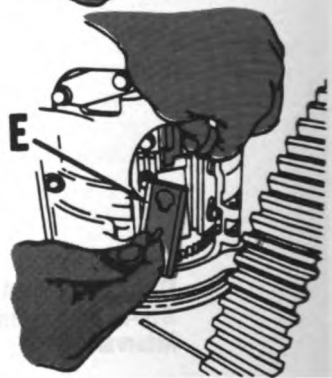
- Rotate cannon until bolt is in access cover area, and release BRAKE-CLEAR AND BRAKE switch. Then move bolt forward to clear removable track (E).



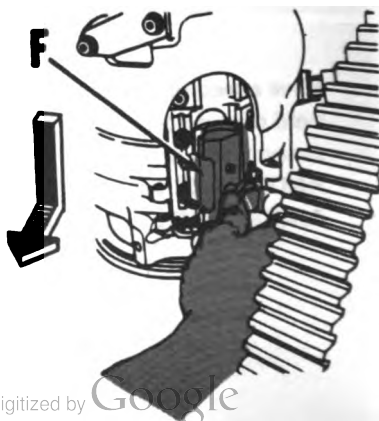
- Use bolt access cover pin (B) to depress track lock pin and release removable track.



- Move track (E) to rear and out.

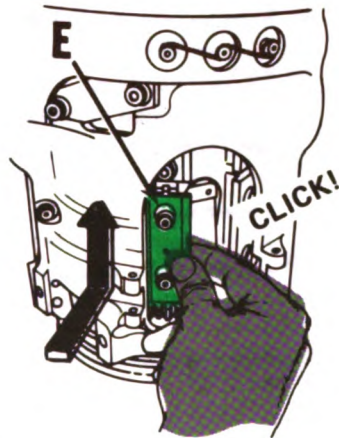


- Slide bolt (F) to rear and lift out.



M168 CANNON — CONTINUED

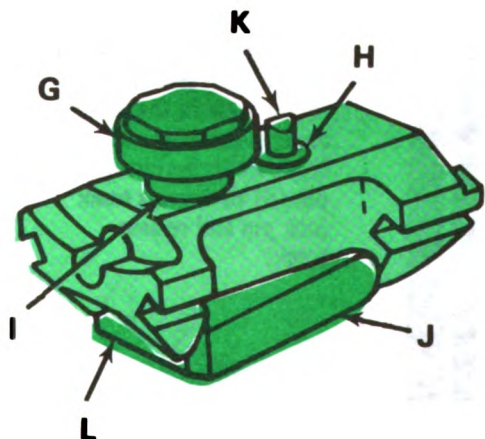
- Wipe clean and replace removeable track (E) with large diameter hole toward muzzle of cannon, and slide track forward until locking pin snaps into place.
- Remove five remaining bolts in the same manner replacing each track.

**Cleaning.**

- Clean rotor tracks and breech bolt assemblies and lubricate (LO 9-1005-286-13).

Inspection.**Breech bolts**

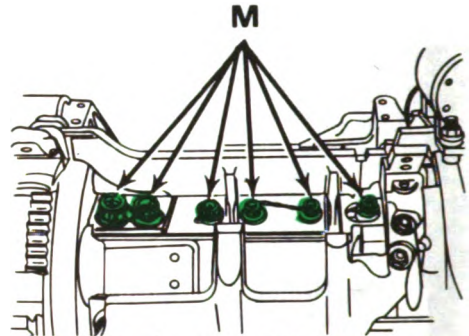
- Check roller (G) on bolt shaft for free movement, flats and gouges.
- Check visible portion of firing pin cam insulation (H) for cracks.
- Check bolt shaft (I) for grooves, nicks, burrs, and cracks.
- Check bolt shaft, locking block (J), and firing pin cam (K) for freedom of movement.
- Check locking surface (L) for scoring or damages.
- Check for proper lubrication (LO 9-1005-286-13).

**Rotor****CAUTION**

Don't hold BRAKE-CLEAR AND BRAKE switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

M168 CANNON – CONTINUED

- Remove case and link chutes.
- Hold switch in CLEAR AND BRAKE position.
- Rotate cannon in firing direction and check that safety wiring on track bolts and screws (M) is undamaged.
- After check, install case and link chutes. Make sure link chute is connected properly to feeder.



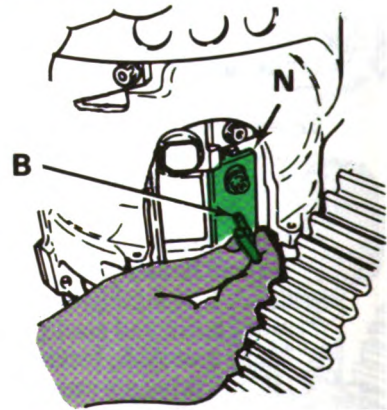
NOTE: Feeder removed for clarity.

Installation

CAUTION

Don't hold BRAKE-CLEAR AND BRAKE switch in CLEAR AND BRAKE position longer than 10 seconds during any 1 minute interval.

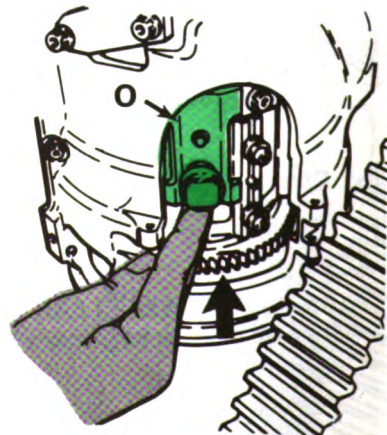
- Set switch to CLEAR AND BRAKE and rotate cannon until a right side track (N) appears in the cover area. Release switch. Use bolt access cover pin (B) to depress track lock pin and release track.



CAUTION

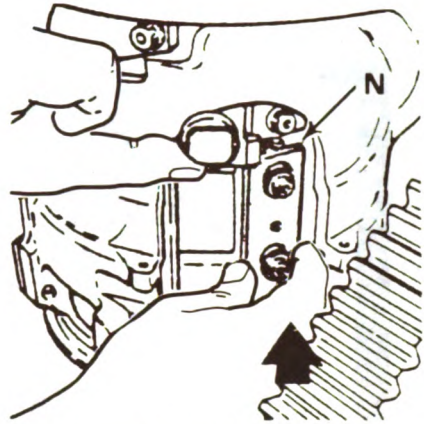
Insure that rotor track is free of any other bolts.

- Install bolt (O) on track and move bolt forward.



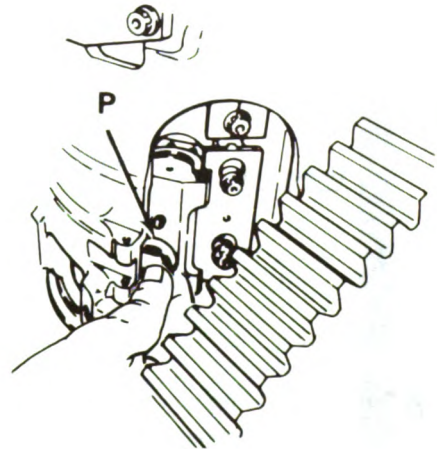
M168 CANNON — CONTINUED

- Reinstall removeable track (N).



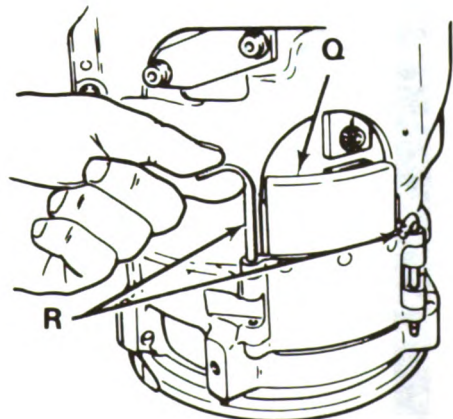
NOTE: Have an assistant set BRAKE-CLEAR AND BRAKE switch to CLEAR AND BRAKE position on your command.

- Push in on bolt roller shaft (P). Set switch to CLEAR AND BRAKE position, ensure roller is aligned with cam path, and rotate it in position to install next bolt. Release switch. Remove right track.

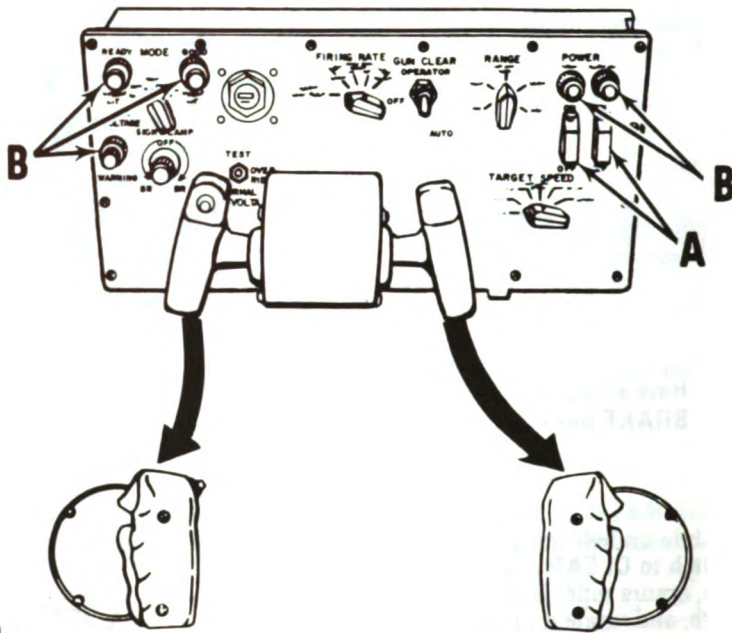


- Install remaining bolts in the same manner.

- Install bolt access cover (Q) and secure with pins (R).
- Set BRAKE- CLEAR AND BRAKE switch to CLEAR AND BRAKE position.
- Manually rotate cannon one revolution.
- Lower cannon and install gun shield.



CONTROL ASSEMBLY



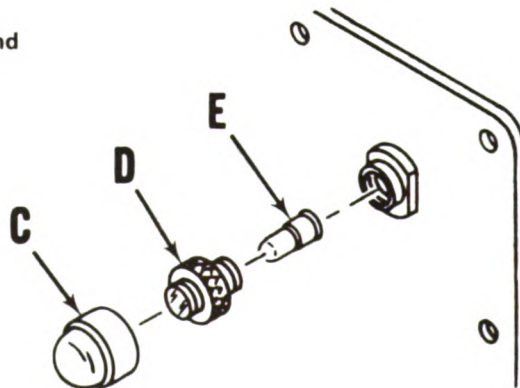
Inspection.

- Check all switches for free movement and smoothness of operation.
- Check for chipped or flaking paint.
- Check markings for legibility.
- Check that guards (A) pivot smoothly over switches.

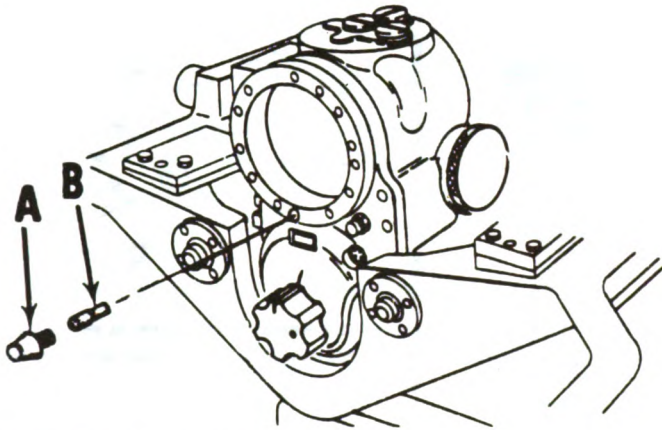
Cleaning. Dry cleaning solvent (SD-2, item 2, appendix D) may be used to clean grease and oil from unpainted metal parts.

Lamp (B) replacement.

Unscrew cover (C), lens (D) and replace lamp (E).



M61 SIGHT AND AZIMUTH INDICATOR

**LAMP REPLACEMENT**

Ready to fire lamp - Unscrew red lens cover (A) remove lamp (B), and replace.

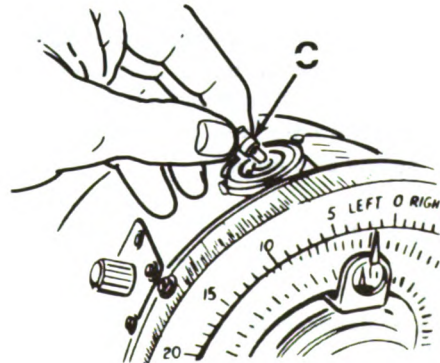
Azimuth indicator lamps (4) - unscrew lamp (C) and replace.

CAUTION

In cleaning, use care not to scratch lens.

CLEANING

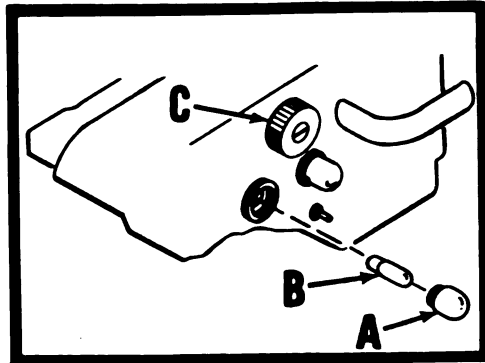
All glass surfaces on the sight should be cleaned with cheesecloth (item 4, appendix D). Dry cleaning solvent (item 2, appendix D) may be used to clean grease and oil from unpainted metal parts.



RECEIVER-TRANSMITTER AND RF POWER LAMPS

LAMP REPLACEMENT

Receiver-transmitter front panel lamps, two. Unscrew lens cover (A) and replace lamp (B).



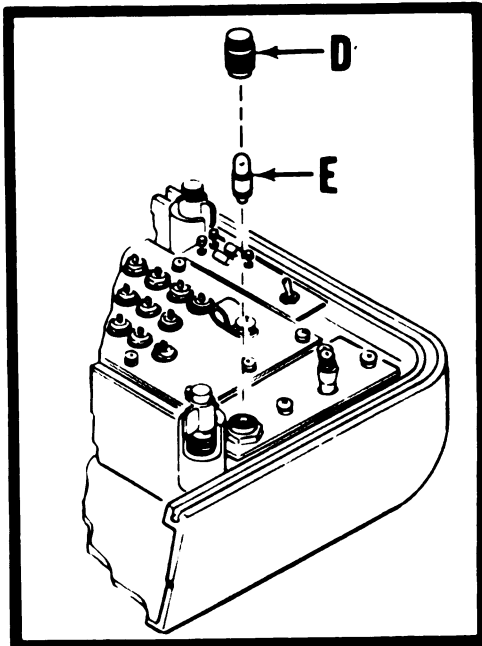
Receiver-transmitter power lamp (inside).



WARNING

High voltage is present in receiver-transmitter when radar is energized to radiate. Death on contact may result if personnel fail to observe safety precautions.

- Set control assembly SYSTEM POWER switch to OFF.
- Remove cable guard.
- Open front panel by turning four thumbscrews (C) counterclockwise.
- Unscrew lens (D) and replace Lamp (E).
- Close front panel and secure with thumbscrews.
- Replace cable guard.

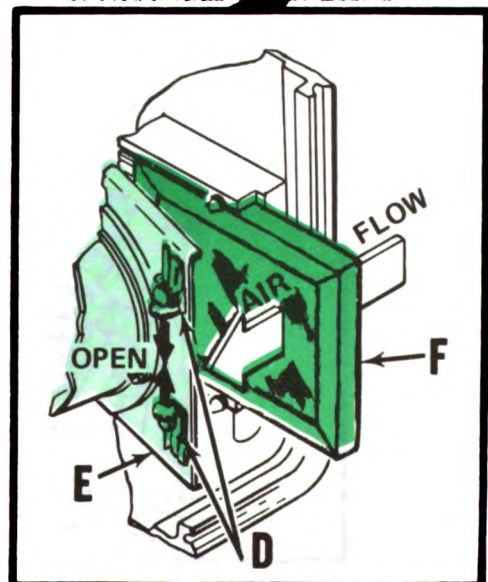
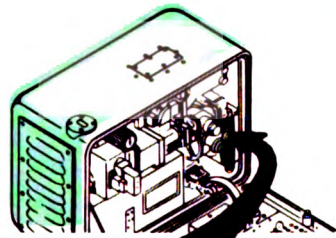
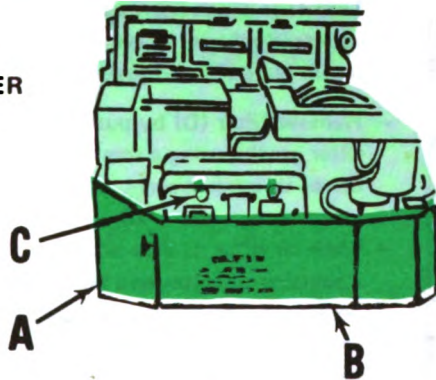


RECEIVER-TRANSMITTER AIR FILTER

Removal and Cleaning.**WARNING**

High voltage is present in receiver-transmitter when radar is energized to radiate. Death on contact may result if personnel fail to observe safety precautions.

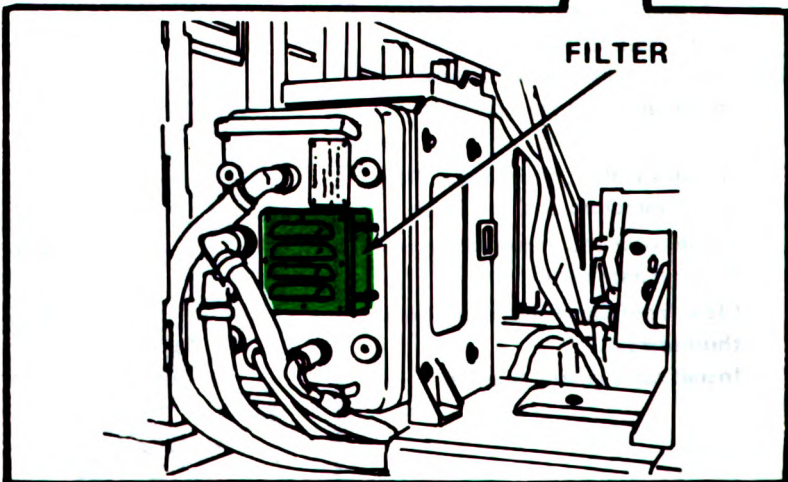
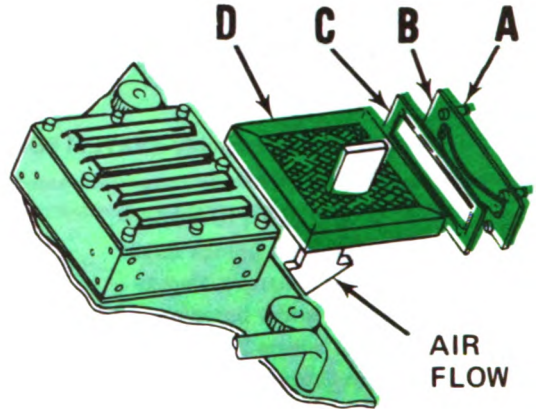
- Set control assembly **SYSTEM POWER** switch to **OFF**.
- To gain access to receiver-transmitter, unlock quick release fasteners, thumbscrews under baseplate, and quick release pins; then slide both cable guards **A** and **B** off.
- Open front panel by turning four thumbscrews (**C**) counterclockwise.
- Open scissor clips (**D**) and cover (**E**).
- Remove filter (**F**).
- Wash air filter in clear water or a solution of water and mild detergent. Hold filter vertically and dip in water to clean. Rinse thoroughly and dry completely before reinstalling.
- Install air filter, observing airflow arrow direction on filter frame.
- Close cover and engage upper and lower scissor clips.
- Close front panel and secure with thumbscrews.
- Install cable guards **A** and **B**.



POWER SUPPLY AIR FILTER

Removal and Cleaning.

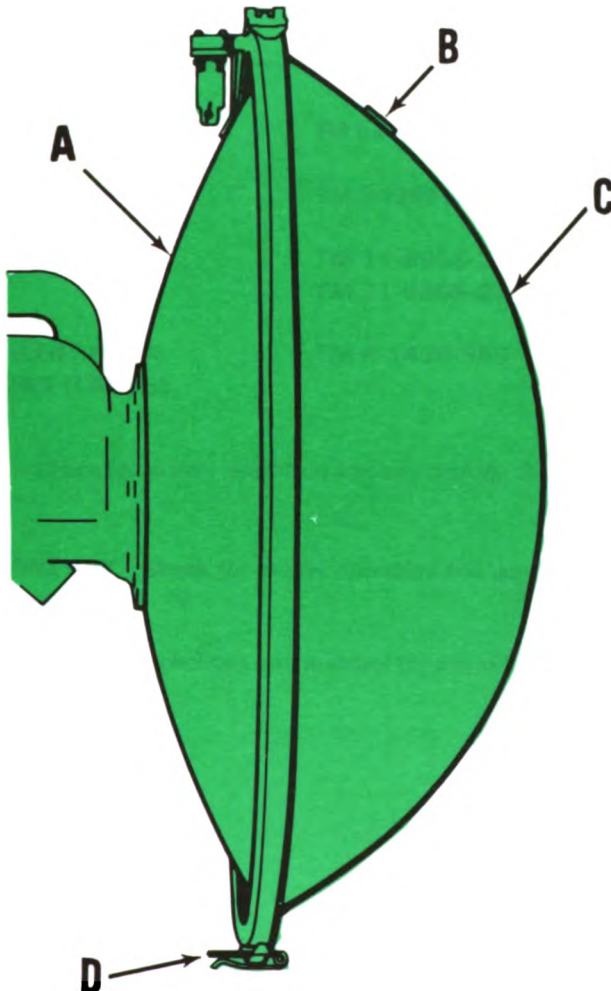
- Loosen thumbscrews, remove quick release pin, and remove cable guard.
- Turn four captive screws (A) counterclockwise to remove access plate (B) and gasket (C).
- Remove filter (D) by pushing filter gently, using a screw-driver through louvers.
- Wash air filter in clear water or a solution of water and mild detergent. Hold filter vertically and dip in water to clean. Rinse thoroughly and dry completely before installing.
- Install air filter (D), observing air flow arrow direction on filter frame.
- Install gasket (C), access plate (B) and secure with four captive screws (A).
- Install cable guard.



ANTENNA REFLECTOR AND RADOME ASSEMBLY

Inspection. (Notify organizational maintenance if defect is found during inspection.)

- Check reflector (A) for dents, bends, or holes. Check for distortion of reflector parabolic shape.
- Check that caplug (B) is installed.
- Check radome (C) for dents, bends, or holes.
- Check that radome (C) is attached securely to reflector and that draw latch handle is secured with pin (D).



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CHAPTER 4

MAINTENANCE OF

AUXILIARY EQUIPMENT

4-1. Introduction. This chapter contains maintenance procedures for equipment used in connection with the gun system.

4-2. When performing maintenance, record any maintenance action according to TM 38-750. Notify organizational maintenance of any malfunctions beyond your scope to correct.

4-3. For maintenance of the following equipment refer to applicable TM.

AUXILIARY POWER UNIT	TM 5-6115-323-14	
GUNNER'S QUADRANT	TM 9-1290-200-14	
NIGHT VISION SIGHT	TM 11-5855-202-13/ TM 11-5855-214-10	■
TARGET ALERT DATA DISPLAY SET (TADDS)	TM 9-1430-589-12	■

H-251/U HEADSET. Check for proper operation and any damage that may cause failure of the headset.

TA-312/PT TELEPHONE SET. Check for proper operation and any damage that may cause failure of the telephone set.

BORESIGHT KIT. Check M109 telescope and mandrel for any damage that may affect accuracy.

CHAPTER 5

AMMUNITION

Section I. GENERAL

5-1. General. This chapter contains a description of 20MM ammunition intended for use with the cannon. National stock numbers and pertinent data for the standard ammunition are listed in SC-1305/30 IL.



WARNING



Rechambering of live ammunition is prohibited. The use of previously chambered cartridges may result in damage to equipment or injury to personnel due to cartridge hangfire. Propellant-primer contamination, a cause of hangfire, can occur because the chambering action may loosen the projectile in the cartridge case and break the waterproof seal. Any cartridges that have been chambered and later extracted unfired will be disposed of in accordance with TM 9-1300-206 and/or local regulations.

5-2. Description and Identification. The ammunition is painted and color coded to provide a ready means of identification. Caliber, type, model, and lot number are marked on the projectiles. The following table shows the types and color codes. The ammunition types are further described following the table.

Table 5-1. Types and Color Codes of Ammunition

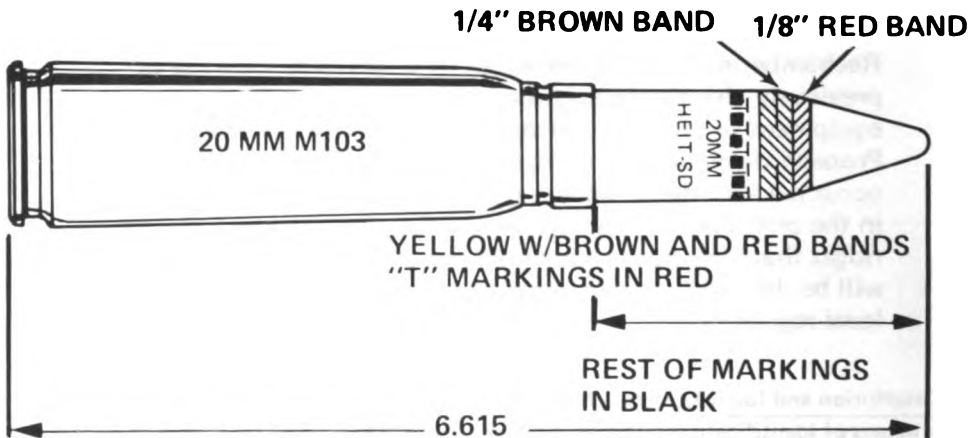
Key Fig.	Kind of ammunition	Color of projectile	Color of marking
1	HEIT-SD M246/M246A1 (high-explosive incendiary tracer-self destruct)	Yellow w/brown and red bands	"T" in red, rest of markings black
2	HEI, M56A3/M56A4 (high-explosive incendiary)	Yellow w/red band	Black
3	TP-T, M220 (target practice-tracer)	Blue	"T" in orange, rest of markings in white
4	TP, M55A2 (target practice)	Blue	White
5	Dummy, M51A2	Chromate	Metal Stamping

AMMUNITION – CONTINUED

DESCRIPTION AND IDENTIFICATION

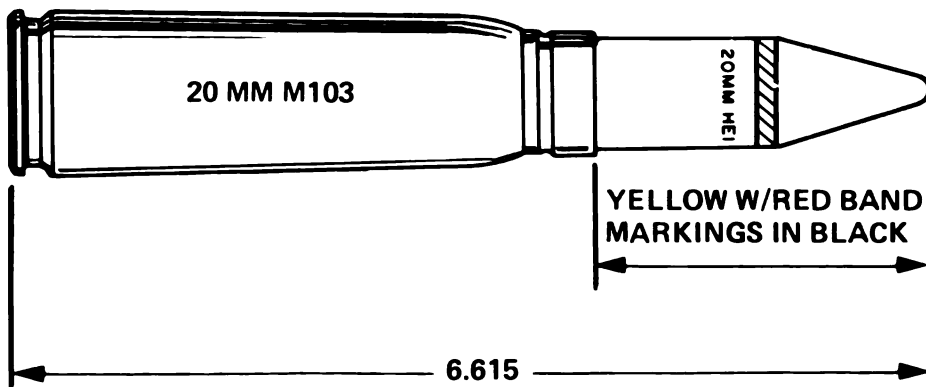
1

High-Explosive Incendiary With Tracer Self-destroying (HEIT-SD), M246/M246A1. This cartridge is assembled with an M505A3 point detonating (PD) fuze. The projectile, in addition to the M505A3 fuze, consists of an HEI charge, self-destruct relay charge, and a tracer charge. These charges form the self-destruct chain. The tracer burns for about 3 to 7 seconds, whereupon the relay charge is ignited which detonates the HEI charge low order. If impact with a target occurs, prior to self-destruction, the M505A3 fuze causes the HEI charge to detonate high order. This cartridge is for use against aerial targets. The basic difference between the models is in the loading of the projectiles. In the M246 projectile, the Incendiary and the HE mix are combined in one pellet. In the M246A1 projectile, the Incendiary is loaded as a separate pellet and the HE mix is also loaded as a separate pellet along with the self-destruct relay pellet and the tracer charge pellet.



2

High-Explosive Incendiary (HEI), M56A3/M56A4. This cartridge is for use against ground targets, including lightly armored vehicles, functioning with both explosive and incendiary effect. The projectile consists of an HEI charge and is assembled with the M505A3 fuze. The M505A3 fuze is a point-detonating, single-action fuze intended to function on impact with the target. The models differ in the method of loading the projectile. The M56A3 has the HE mix and the Incendiary mix combined in one pellet. The M56A4 has the Incendiary pellet inserted into the projectile, and then the HE mix pellet is added.

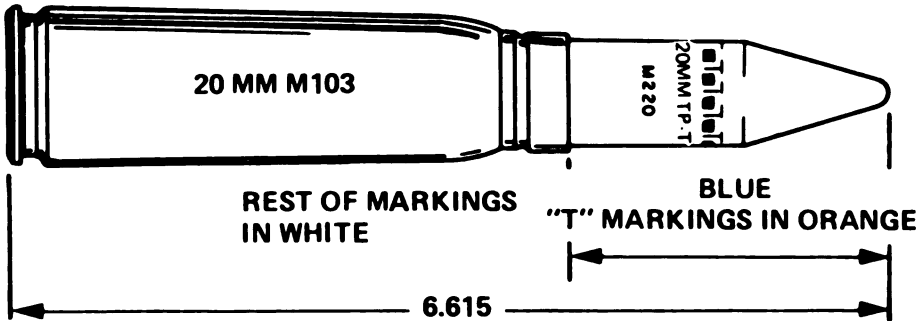


AMMUNITION - CONTINUED

DESCRIPTION AND IDENTIFICATION-CONTINUED

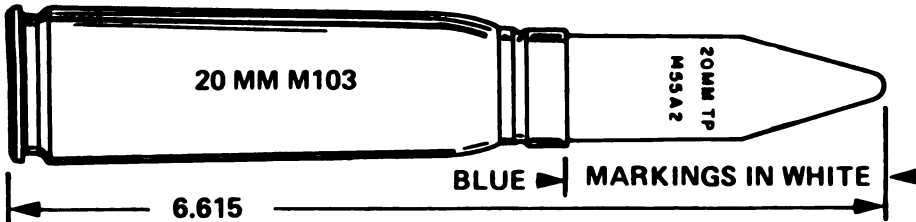
3

Target Practice - Tracer (TP-T), M220. This cartridge is for practice and training. The projectile is similar to the M56A3 projectile, but has no HEI charge and is assembled with a dummy fuze. The projectile does contain a tracer composition which burns visibly for a minimum of 1.9 seconds.



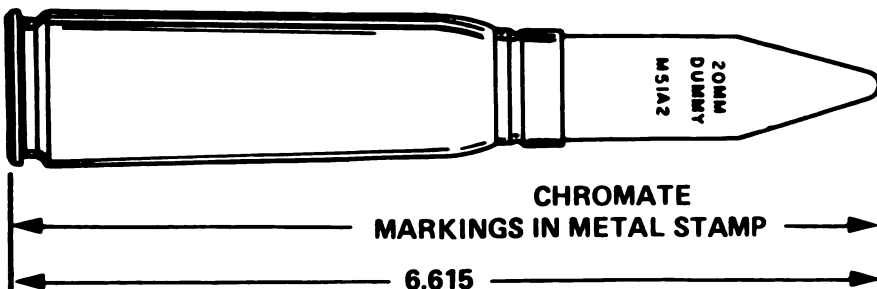
4

Target Practice (TP), M55A2. This cartridge is for practice and test firings. The projectile is similar to the M56A3 projectile, but is hollow and contains no HEI charge or tracer.



5

Dummy, M51A2. The dummy is a completely inert assembly used for nonfiring system checkout.



AMMUNITION-CONTINUED

Section II. PREPARATION FOR FIRING

5-3. Ammunition will be visually inspected to assure that it is clean, free of grease and corrosion, and that it is free of perforations, cracks and splits, severe scratches, cuts and dents other than those caused by normal delinking and relinking operation.

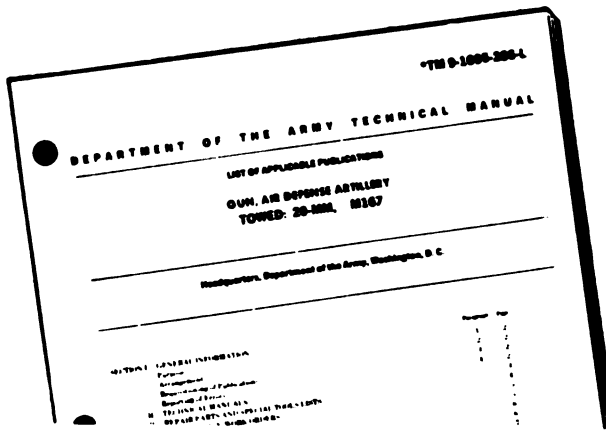
Section III. CARE, HANDLING AND PRESERVATION

5-4. Explosive ammunition must be handled with appropriate care at all times. Explosive elements such as primers and fuzes are sensitive to excessive shock, electrical discharge, and temperature. Keep ammunition in a serviceable condition and ready for immediate use as follows:

- (1) Store ammunition in original containers in a dry, well-ventilated place protected from rays of sun and other sources of excessive heat.**
- (2) Keep ammunition and its container clean and dry and protected from possible damage.**
- (3) Disassembly of components of ammunition, such as fuzes and primers, is strictly prohibited. Any alteration of ammunition is hazardous and shall not be undertaken. Relinking of ammunition is permitted.**
- (4) Do not open sealed ammunition containers or remove protective or safety devices until just before use.**
- (5) Return ammunition, prepared for firing but not fired, to its original packing and mark it appropriately. Use such ammunition first in subsequent firings in order to keep stocks of opened packages at a minimum.**

APPENDIX A

PUBLICATION REFERENCES



A COMPLETE LIST OF CURRENT REFERENCES, INCLUDING SUPPLY MANUALS, TECHNICAL MANUALS AND OTHER AVAILABLE PUBLICATIONS REQUIRED TO PERFORM YOUR MISSION CAN BE FOUND IN TM 9-1005-286-L. MAKE SURE YOU USE A CURRENT LISTING IF YOU ORDER ADDITIONAL COPIES OF PUBLICATIONS.



APPENDIX B

COMPONENTS OF END ITEM LIST AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. Scope. This appendix lists components of end item and basic issue items for the M167A1 towed air defense gun to help you inventory items required for safe and efficient operation.

B-2. General. The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. **Section II. Components of End Item.** This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. **Section III. Basic Issue Items.** These are the minimum essential items required to place the M167A1 towed air defense gun in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the M167A1 towed air defense gun during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-3. Explanation of Columns. The following provides an explanation of columns found in the tabular listings:

a. **Column (1) - Illustration Number (Illus Number).** This column indicates the number of the illustration in which the item is shown.

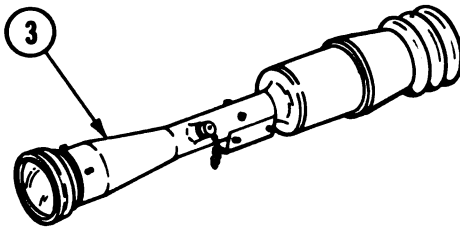
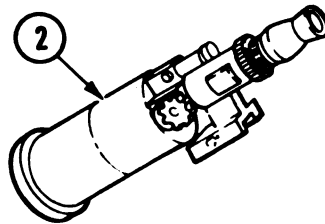
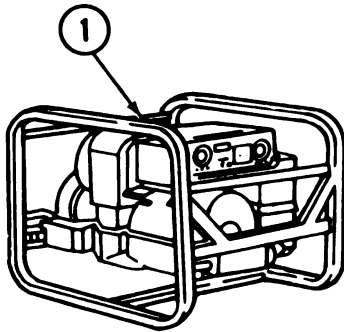
b. **Column (2) - National Stock Number.** Indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

c. **Column (3) - Description.** Indicates the National item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. **Column (4) - Unit of Measure (U/M).** Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. **Column (5) - Quantity required (Qty rqr).** Indicates the quantity of the item authorized to be used with/on the equipment.

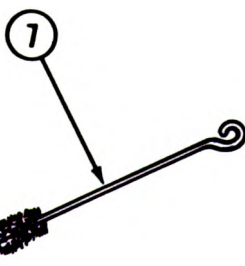
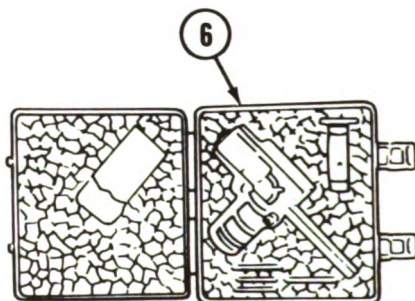
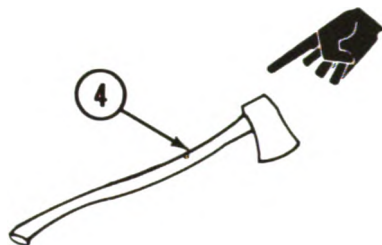
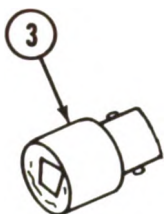
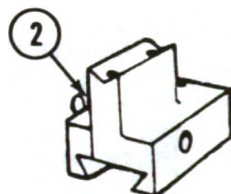
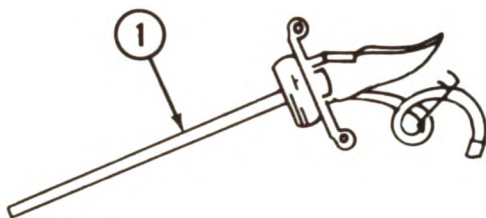
Section II. COMPONENTS OF END ITEM



COMPONENTS OF END ITEM (COEI) - Continued

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable On Code	(4) U/M	(5) Qty rqr
1	6115-00-017-8236	GENERATOR SET: 1.5 kw (97403) 13213E2700	G41	EA	1
2	5855-00-629-5327	NIGHT VISION SIGHT, AN/TVS-5 (80063) SMD850100-1	G41	EA	1
3	1240-00-179-1155	TELESCOPE, STRAIGHT: M134 (19200) 11728190	G41	EA	1

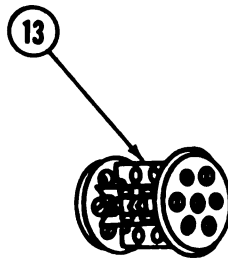
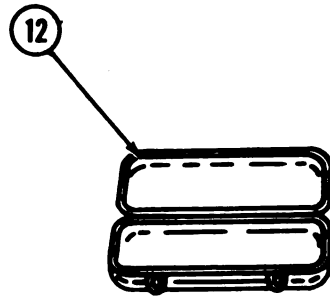
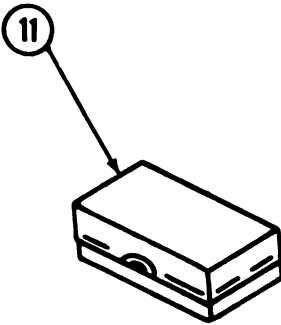
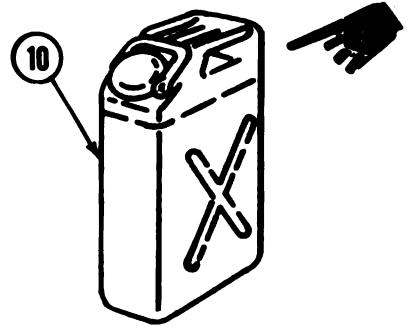
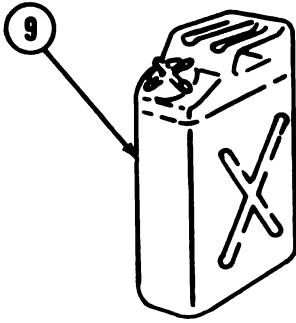
Section III. BASIC ISSUE ITEMS



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
(a) FIG NO.	(b) ITEM NO.				
B-1	1	2910-00-066-1235	ADAPTER, CONTAINER (06076) 13211E7541	EA	1
B-1	2	1005-01-138-3874	ADAPTER, MOUNTING (AN/TVS-5) (19200) 12011766	EA	1
B-1	3	5120-00-240-8703	ADAPTER, SOCKET WRENCH: 3/8 in. sq female, 1/2 in. sq male (81348) GGG-W-641	EA	1
B-1	4	5110-00-293-2336	AX, SINGLE BIT (81348) GGG-A-926	EA	1
B-1	5	5140-00-473-6256	BAG, TOOL, SACHEL (81349) MIL-B-43663	EA	1
B-1	6	4931-00-997-4568	BORESIGHT KIT ASSEMBLY (19200) 10545540	EA	1
B-1	7	1005-00-722-5087	BRUSH, CLEANING, SMALL ARMS (19205) 7225087	EA	1
B-1	8	1005-00-610-8828	BRUSH, CLEANING, SMALL ARMS (19206) 6108828	EA	1

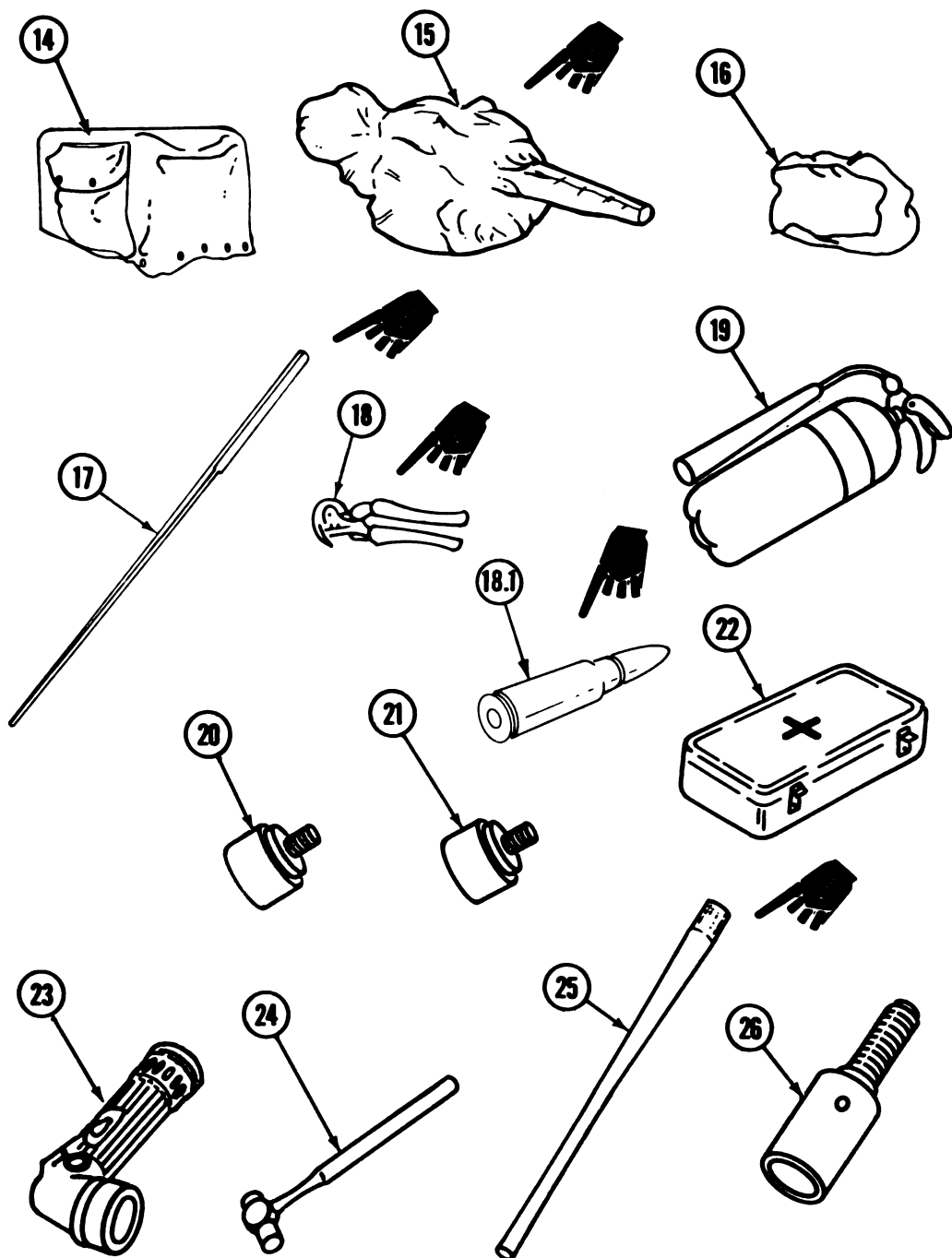
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1)		(2)	(3)	(4)	(5)
ILLUSTRATION		National Stock Number	Description FSCM and Part number	U/M	Qty rqr
(4) FIG NO.	(5) ITEM NO.				
B-1	9	7240-00-222-3088	CAN, GASOLINE, MILITARY, 5 GAL CAN (81349) MILC1283	EA	1
B-1	10	7240-00-242-6153	CAN, WATER, MILITARY 5 GAL CAN (81349) MILC13984	EA	1
B-1	11	1290-00-809-1379	CASE, PLASTIC (FOR BULBS) (19200) 10557496	EA	2
B-1	12	1240-00-702-9652	CASE, TELESCOPE (M134) (19200) 10553971	EA	1
B-1	13	1005-00-754-5291	CLAMP ASSEMBLY, MUZZLE (GROUND) (19205) 11010336	EA	1

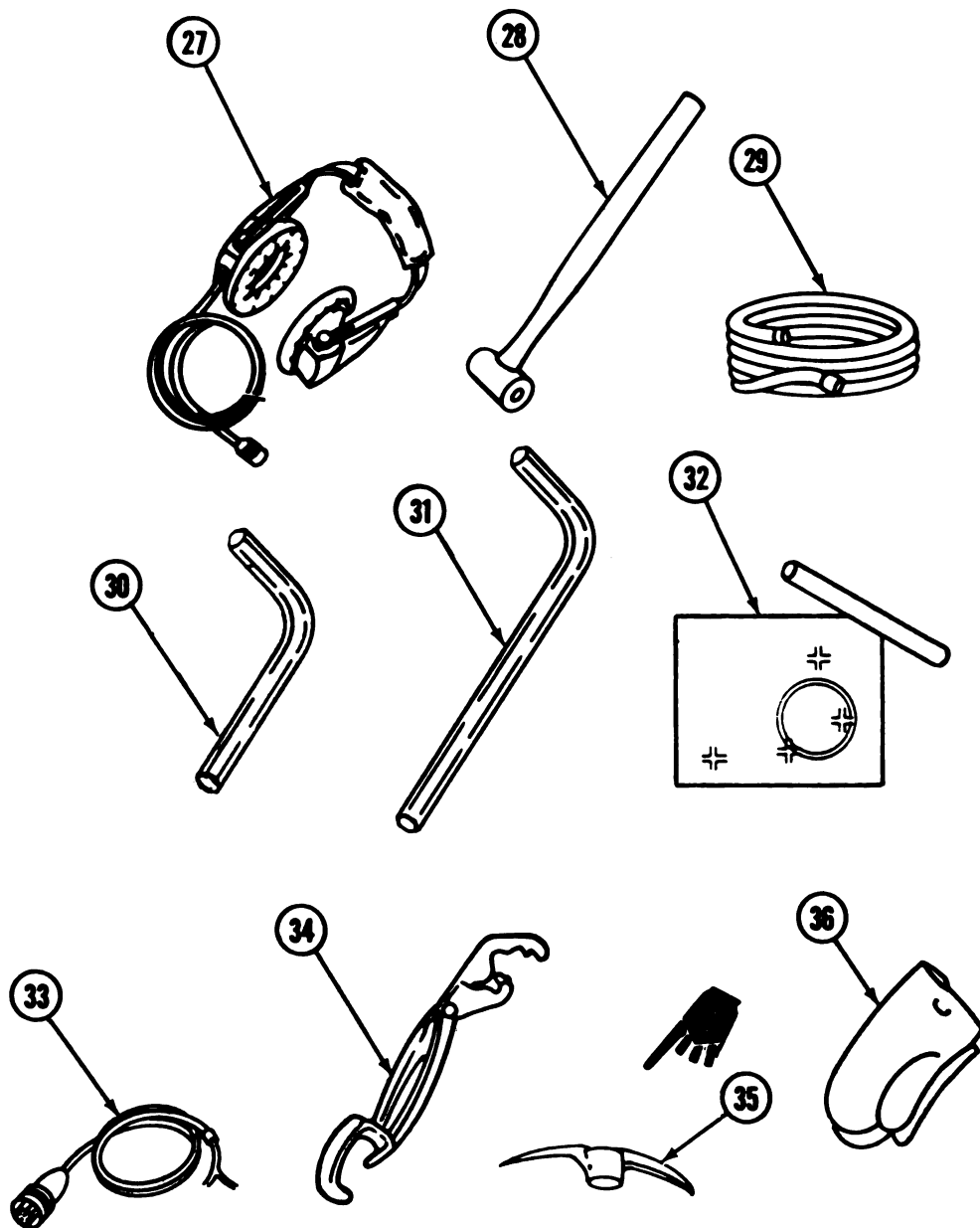
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
(a) FIG NO	(b) ITEM NO				
B-1	14	6115-00-941-1655	COVER, GENERATOR SET (97403) 13214E0156	EA	1
B-1	15	1005-01-150-5869	COVER, GUN MOUNT (19200) 9352711	EA	1
B-1	16	1015-00-678-9666	COVER, GUN MUZZLE (19206) 8766037	EA	1
B-1	17	5120-00-224-1390	CROWBAR (STYLE 1, SECT K) (81348) GGGB101	EA	1
B-1	18	5110-00-595-8229	CUTTER, WIRE ROPE (81349) MIL-C-386	EA	1
B-1	18.1	1305-00-157-4616	DUMMY, CARTRIDGE 20-MM (100 rd box) (19201) 7259250	EA	2
B-1	19	4210-00-202-7858	EXTINGUISHER, FIRE (81348) OE910	EA	1
B-1	20	5120-00-596-1071	FACE, HAMMER, INSERTED 1 1/2" DIA med plastic. (81348) GGG-H-33	EA	1
B-1	21	5120-00-596-1075	FACE, HAMMER, INSERTED 1 1/2" DIA TOUGH PLASTIC (81348) GGG-H-33	EA	1
B-1	22	6545-00-922-1200	FIRST AID KIT, GENERAL PURPOSE (19204) FIRST-AID	EA	1
B-1	23	6230-00-264-8261	FLASHLIGHT: ELECTRIC, HAND, 2-CELL (81349) MIL-F-3747	EA	1
B-1	24	5120-00-061-8546	HAMMER, HAND BALL-PEEN, 2 LBS (81348) GGG-H-86	EA	1
B-1	25	5120-00-288-6574	HANDLE, MATTOCK (81348) NN-H-93	EA	1
B-1	26	1005-00-402-2200	HEAD, BELL RAMMER (19206) 8766006	EA	1

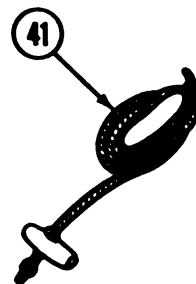
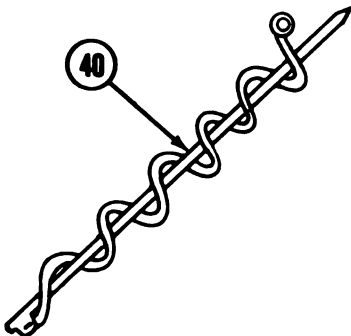
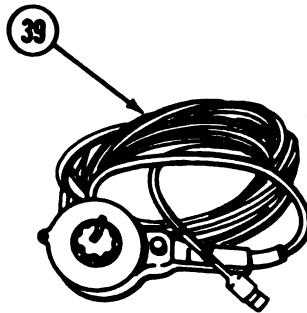
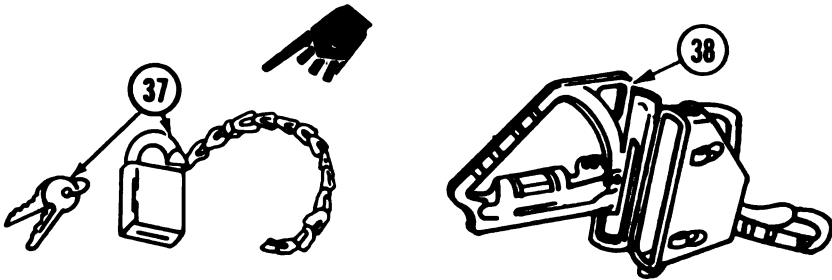
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION (A) FIG. NO. (B) ITEM NO.		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
B-1	27	5965-00-043-3460	HEADSET, ELECTRICAL (81134) H251U	EA	1
B-1	28	5120-00-903-8555	HOLDER, INSERTED HAMMER (81348) GGG-H-33	EA	1
B-1	29	4720-00-814-0321	HOSE ASSEMBLY (88044) AN6270- 4D1440	EA	1
B-1	30	5120-00-224-2504	KEY, SOCKET HEAD SCREW, 5/64 IN. (81348) GGG-K-275	EA	1
B-1	31	5120-00-224-4659	KEY, SOCKET HEAD SCREW, HEX DRIVE L TYPE HDL, 1/4 IN. (81348) GGG-K-275	EA	1
B-1	32	1005-01-150-6041	KIT, BORESIGHTING TARGET (19200) 5911308	EA	1
B-1	33	1005-00-936-5387	LEAD, ELECTRICAL (W-11) (19204) 8437142	EA	1
B-1	34	4925-00-787-9803	LINKER-DELINKER, HAND OPERATED (19205) 7790853	EA	1
B-1	35	5120-00-243-2395	MATTOCK (PICK TYPE) (19207) 11677022	EA	1
B-1	36	8415-01-092-0039	MITTEN, HEAT CLOTH (ASBESTOS) (81349) MIL-M-11199F	EA	1

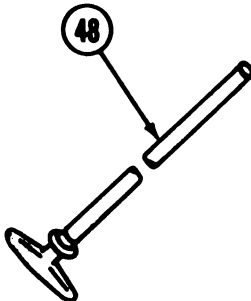
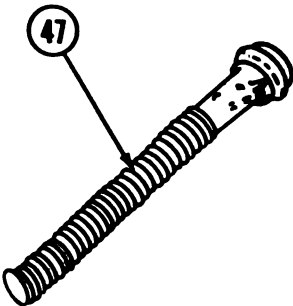
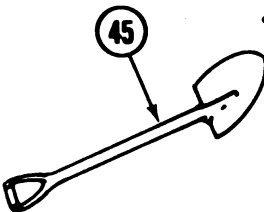
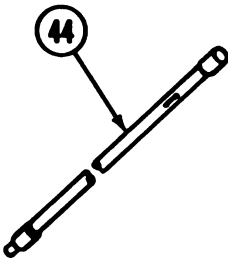
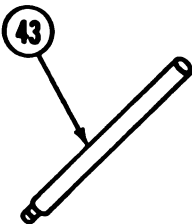
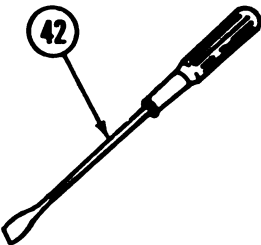
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION (a) FIG NO (b) ITEM NO		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
B-1	37	5340-00-682-1508	PADLOCK (PIN TUMBLER TYPE) (96906) MS35847-3	EA	1
B-1	38	1290-00-891-9999	QUADRANT, FIRE CONTROL (19200) 7197156	EA	1
B-1	39	1265-00-997-4569	RANGE CONTROL ASSEMBLY (19200) 10545548	EA	1
B-1	40	5975-00-878-3791	ROD, GROUND (81349) MILR11461	EA	1
B-1	41	2990-00-972-7950	ROPE, STARTER, ENGINE (02978) ER02520	EA	1

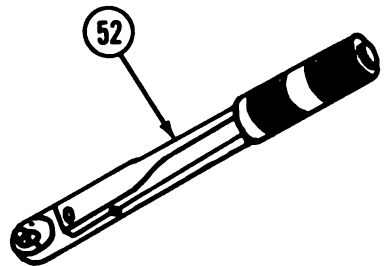
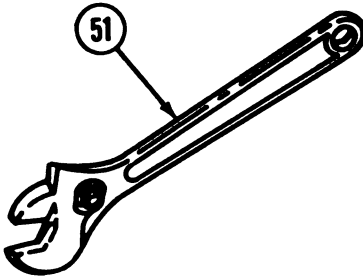
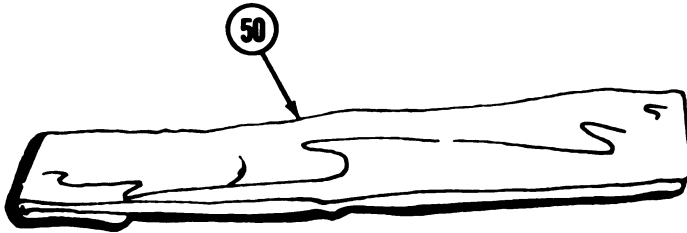
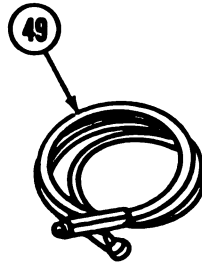
BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION (a) FIG NO. (b) ITEM NO.		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
B-1	42	5120-00-010-7915	SCREWDRIVER, FLAT TIP (Cab Type 1/4 in X 6 in lg) (81348) GGG-S-121	EA	1
B-1	43	1005-00-709-7668	SECTION ASSEMBLY, BRUSH (19205) 8766014	EA	3
B-1	44	1015-00-790-3611	SECTION END, CLEANING (19206) 8766008	EA	1
B-1	45	5120-00-293-3336	SHOVEL, HAND (RD POINT) (81348) GGG-S-326	EA	1
B-1	46	5120-00-189-7935	SOCKET, SOCKET WRENCH (1/2 sq drive, 12 pt, 15/16 opng) (81348) GGG-W-641	EA	1
B-1	47	7240-00-177-6154	SPOUT, CAN, FLEXIBLE CAM TYPE 16 L, 2 1/4 OD CAM, 1.238 OD TUBE (81349) MILS1285	EA	1
B-1	48	1010-00-832-9153	STAFF, CLEANING (19204) 11687054	EA	1

BASIC ISSUE ITEMS (BII) - Continued



BASIC ISSUE ITEMS (BII) - Continued

(1) ILLUSTRATION		(2) National Stock Number	(3) Description FSCM and Part number	(4) U/M	(5) Qty rqr
48 FIG NO.	49 ITEM NO.				
B-1	49	1005-00-824-4485	SWITCH AND LEAD ASSEMBLY (19204) 8437361	EA	1
B-1	50	8340-00-817-2126	TARPAULIN (81348) K-P-146	EA	1
B-1	51	5120-00-264-3796	WRENCH, ADJUSTABLE 1.332 IN. JAW, 12 IN. LG (19207) 11655778-5	EA	1
B-1	52	5120-00-294-9505	WRENCH, TORQUE 150-750 IN LB, 3/8" SQ-DR (81348) GGGW00686	EA	1

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. Scope. This appendix lists additional items you are authorized for the support of the M167A1 towed air defense gun.

C-2. General. This list identifies items that do not have to accompany the M167A1 towed air defense gun and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. Explanation of Listing. National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

Section II. ADDITIONAL AUTHORIZATION LIST

(1)	(2)	(3)	(4)
NATIONAL STOCK NUMBER	DESCRIPTION FSCM & PART NUMBER USABLE ON CODE	U/M	QTY AUTH
<u>MTOE AUTHORIZED ITEMS</u>			
1005-00-504-3839	ADAPTER, COUPLER (19204) 8438335	EA	1
5140-00-653-4198	CHEST, TOOL (19204) 6534198	EA	1
5310-00-073-2076	NUT, PLAIN, SLOTTED, HEXAGON (19204) 8433599	EA	1
5315-00-187-9591	PIN, COTTER (96906) MS24665-689	EA	1
5120-00-256-2150	PLIERS: duck bill, 6 in. lg (81348) GGGP471	EA	1
8110-00-142-9336	TUBE, MAILING, AND FILING WATERPROOF TELESCOPIC W/CAPS: 4-in. inside dia, 43 in. long (81348) PPPT495	EA	1
5310-00-983-6974	WASHER, FLAT (19204) 8433595	EA	1
<u>CTA AUTHORIZED ITEMS</u>			
1240-00-930-3833	BINOCULAR (19200) 10547052	EA	2
3985-00-498-8343	REELING MACHINE (81349) MILR3206	EA	1
5805-00-543-0012	TELEPHONE SET (81349) TA312PT	EA	1

APPENDIX D

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LISTS

Section I. INTRODUCTION

D-1. Scope. This appendix lists expendable/durable supplies and materials you will need to operate and maintain the M167A1 towed air defense gun. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

D-2. Explanation of Columns.

a. **Column 1 - Item number.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e. g., "Use cleaning compound, Item 2, App D").

b. **Column 2 - Level.** This column identifies the lowest level of maintenance that requires the listed item.

C – Operator/Crew

O – Organizational Maintenance

c. **Column 3 - National Stock Number.** This is the National stock number assigned to the item; use it to request or requisition the item.

d. **Column 4 - Description.** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. **Column 5 - Unit of Measure (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
1	C	6135-00-120-1020	BATTERY, DRY 1.5V (BA-30) (96906) MS75059	EA
2	C	6850-00-597-9765 6850-00 274-5421	CLEANING COMPOUND, SOLVENT SD-2 (80063) 6G236-6 1 GAL CAN 5 GAL CAN (81348) P-D-680	GL
3	C	9150-01-054-6453	CLEANER/LUBRICANT/ PRESERVATIVE, CLP (81349) MIL-L-63460 1 pt (spray bottle)	PT
4	C	8305-00-267-3015	CLOTH, CHEEECLOTH 36 IN. WIDE (81348) CCCC440	IN.

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
5	C	8010-00-081-0809	ENAMEL (81348) TTE529	QT
6	C	8010-00-080-2173	ENAMEL (GREEN) (81348) TTE529	QT
7	C	8010-00-181-7402	ENAMEL (OLIVE DRAB) (81349) MILE46136	PT
8	C	9150-00-190-0905	GREASE, AUTOMOTIVE AND ARTILLERY (GAA) (81349) MIL-G-10924 5 LB CAN	LB
9	C	9150-00-935-4017	GREASE, AIRCRAFT (INSTRUMENT) GIA (81349) MIL-G-23827 8 OZ TUBE	OZ
10	C	9150-01-071-0749	GREASE, AIRCRAFT ORD (07950) XP-190	CN
11	C	9150-00-935-9807 9150-00-935-9808	HYDRAULIC FLUID, PETROLEUM BASE OHT, (81349) MILH6083 1 QT CAN 1 GAL CAN	QT GL

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIDNAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
12	C	6240-00-763-7744	LAMP, INCANDESCENT (81348) W-L-00111/7	EA
13	C	6240-00-156-7836	LAMP, INCANDESCENT (96906) MS25237-327	EA
14	C	6240-00-997-4559	LAMP, INCANDESCENT (08806) 835	EA
15	C	6240-00-156-8707	LAMP, INCANDESCENT (81348) W-L-00111/59	EA
16	C	9150-00-142-9399	LUBRICANT, SOLID FILM SFD (19204) RIAPD703 12 OZ CAN	OZ
17	C	9150-00-834-5608	LUBRICANT, SOLID FILM SFD (81349) MILL8937 1 PT CAN	PT
18	C	9150-00-231-6699	LUBRICATING OIL, GENERAL PURPOSE, PRESERVATIVE, PL S (81348) VVL800 1 QT CAN	QT
19	C	9150-00-231-2361	LUBRICATING OIL, GENERAL PURPOSE PRESERVATIVE, MEDIUM, PL-M (81349) MILL3150 1 QT CAN	QT
20	C	9150-00-940-9323	LUBRICATING OIL, SEMI-FLUID, LSA-T (81349) MIL-L-46150 8 OZ TUBE	TU
21	C	9150-00-889-3522	LUBRICATING OIL, SEMI-FLUID, AUTOMATIC WEAPONS, LSA (81349) MILL46000 4 OZ BOTTLE	OZ

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Continued

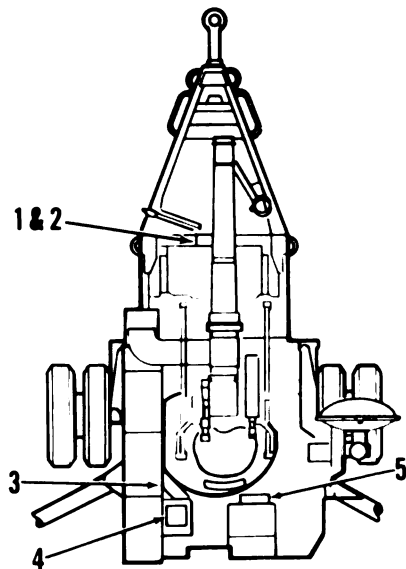
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION FSCM AND PART NUMBER	(5) U/M
22	C	5350-00-221-0882	PAPER (ABRASIVE, 9 IN. BY 11 IN. SHEETS) (58536) A-A-1201 100 EA PER PGK	EA
23	C	6640-00-597-6745	PAPER LENS (81348) NNNP40 50 EA PER BX	EA
24	C	8010-00-515-2211	PRIMER COATING YELLOW (81348) TT-P-1757 5 GAL CAN	GL
25	C	8010-00-264-7857	PRIMER COATING (81349) MILE46127 1 PT CAN	PT
26	C	7920-00-205-1711	RAG: wiping (58536) A-A-531 50 lb bale	LB
27	C	8030-00-889-3534	TAPE, ANTISEIZING (260 IN. LG ROLL, IN DISPENSER) (81349) MIL-T-227730	EA

APPENDIX E

STOWAGE AND SIGN GUIDE FOR COMPONENTS OF END ITEM, BASIC ISSUE ITEMS, AND APPLICABLE ADDITIONAL AUTHORIZATION LIST ITEMS

E-1. Scope. This appendix shows the locations for stowage of equipment and materiel required to be carried on the M167A1 towed air defense gun.

E-2. General. Locations of mounted or stowed basic issue items and additional authorization list items are shown in this appendix. Other items not shown in this appendix are stowed on the prime mover or stowed at the discretion of the chief of section.



TOP VIEW

NO.	STOWAGE PLAN
	ITEM
1	Linker delinker
2	Cable assembly (8437142)
3	Telephone set
4	Boresight kit
5	Gunner's quadrant

ALPHABETICAL INDEX

A

	Page
Additional Authorization List	C-1
Air Density Setting	2-28
Air Filter	
Power Supply Removal and Cleaning.	3-88
Receiver Transmitter Removal and Cleaning.	3-87
Ammunition.	5-1
Care, Handling and Preservation.	5-4
Description and Identification.	5-1
Dummy	5-3
Feed and Storage System	2-25
High Explosive Incendiary with Tracer Self Destroying	5-2
High Explosive Incendiary	5-2
Preparation for Firing	5-4
Storage Unit.	2-3
Target Practice	5-3
Target Practice Tracer	5-3
Types and Color Codes.	5-1
Antenna, Radar	2-13
Boreighting	3-30, 3-30
Inspection	3-89
Servo Drive Check	2-51
Stowing	2-35
Unit 1	2-13
Unstowing	2-40
AN/TVS-2B/AN/TVS-5 Night Vision Sight	
Boreighting	3-37
Controls	2-10
Installation/Removal	2-75
Maintenance	4-1
AN/VPS-2 Radar Set. See Radar	
APU See auxiliary power unit.	
APU Receptacle.	2-78.2
Arming Connector	2-8

ALPHABETICAL INDEX – CONTINUED

A

	Page
Arm Safe Switch	2-19
Firing With.	2-58.1
Automatic Clear	
Firing.	2-58
Auxiliary and Support Equipment	
Operating	2-71
Maintenance.	4-1
Auxiliary Power Unit (APU)	
Battery Charging	3-73
Controls and Instruments	2-20
Maintenance.	4-1
Operation	2-77
Set Up	2-76
Azimuth Drive Motor Brake, Levers	2-12
Azimuth Indicator	
Cleaning	3-85
Lamp Replacement.	3-85
Operation	2-32

B

Barrels	3-75
Cleaning	3-76
Inspection	3-77
Installation	3-78
Removal	3-75
Basic Issue Items List.	B-1
Batteries	3-73
Charging	3-73
Heaters.	2-21
Taps	2-21
Bilge Drain Plug	2-17
Blackout Lights	2-17

ALPHABETICAL INDEX – CONTINUED

B

	Page
Bersighting	
AN/TVS-2B/AN/TVS-5 Night Sight	3-37
Distant Aiming Point Method	3-30
Kit	2-73
M134 Telescope, Distant Aiming Point Method.	3-33
M134 Telescope, Target Method	3-42
Target Method.	3-39
Brake Clear and Brake Switch	2-3, 2-11
Brake Levers	
Azimuth Drive Motor.	2-12
Elevation Drive Motor	2-12
Gun Drive Motor	2-12
Breech Bolts	
Cleaning	3-81
Inspection	3-81
Installation.	3-82
Removal	3-79

C

Caged Knob, M61 Sight	2-9
Cannon	
Clearing	2-59
Maintenance.	3-75
Timing Pin.	2-3
Troubleshooting.	3-60
Centering Clamp	
Cleaning	3-77
Inspection	3-77
Installation.	3-78
Removal	3-75
Charging	
Batteries	3-73

ALPHABETICAL INDEX – CONTINUED

C

	Page
Changing Radar Frequency	3-47
Check	
Antenna Servo Drive	2-51
Daily Armament System	3-19
Elevation Drive Motor Cut-Out	3-21
Firing Interrupter Circuits	3-20
Ground Mode	3-29
Manual Mode	2-44
Midrange Calibration	2-55
Preventative Maintenance Hydraulic	3-8
Radar	3-25
Sight Traverse Lead Angle	3-21
System Power	3-19
Checks and Services, Preventative Maintenance	3-3
Chute Feed	3-10
Clamp	
Centering	3-9
Muzzle, Installation	3-78
Muzzle, Removal	3-77
Cleaning	
Barrels	3-76
Breech Bolts	3-81
Center Clamp	3-77
Control Assembly	3-84
M168 Cannon	3-75
Muzzle Clamp	3-76
Power Supply Air Filter	3-88
Precautions	3-5
Procedures	3-4
Receiver-Transmitter Air Filter	3-87
Rotor Tracks	3-81
Clearing Cannon	2-56
Clutter Lockon Test	2-53
Color Code	
Ammunition	5-1

ALPHABETICAL INDEX – CONTINUED

C

	Page
Communications Equipment	2-72
Components of End Item List	B-1
Computer	
Range.	2-15
Controls. See specific item.	
Control Assembly.	2-4
Cleaning	3-84
Controls and Instruments	2-4
Inspection	3-84
Maintenance.	3-84
Cook-Off.	2-56
Corrective Maintenance	3-71
Batteries	3-73
Control Assembly.	3-84
Declutching Feeder.	3-72
Distribution Box	3-72
M168 Cannon	3-75
M61 Sight and Azimuth Indicator	3-85
Power Supply Air Filter	3-88
Receiver-Transmitter Air Filter	3-87
Receiver-Transmitter and RF Power Lamps	3-86
Covers, Protective.	2-37
Cross Reference, Nomenclature.	1-3

D

Daily Armament System Check.	3-19
Boresighting	3-30
Elevation Drive Motor Cut-Out Check	3-21
Firing Interrupter Check.	3-20
Ground Mode Check	3-29
Precheck Conditions	3-19
Radar Check.	3-25
Sight Current Generator Check	3-24
Sight Traverse Lead Angle Check	3-21
Super-Elevation Check for Manual and External Modes	3-22
System Power Check	3-19

ALPHABETICAL INDEX – CONTINUED

D

	Page
Declutching Feeder	3-72
Delinking, Linking Operation	2-24
Description and Data	1-1
Dial	
Air Density	2-28
Muzzle Velocity	2-29
Setting Chart, Air Density	2-28
Setting Chart, Muzzle Velocity	2-29, 2-30
Dimensions and Weights	1-1
Distant Aiming Point Method	
Boresighting	3-30
Distribution Box, System	2-6.1, 3-7
Inspection	3-72
Dos and Don'ts	
Cold Weather	2-79
Dusty or Sandy Areas	2-83
Hot Weather	2-82
Rainy or Humid Areas	2-84
Salt Water Areas	2-85
Drain Plug	2-38
Drive Motor Brakes	
Azimuth	2-12
Elevation	2-12
Gun	2-12
Drop Pad	2-18
Dusty or Sandy Areas	
Operating In	2-83

E

Elevation	
Boresight Adjustment	2-9
Drive Motor	2-12
Drive Motor Cut-Out Check	3-21

ALPHABETICAL INDEX – CONTINUED

E

	Page
Emplacement	
Gun.	2-38.2
Equipment Improvement Report (EIR)	1-1
Expendable Supplies and Materials List	C-1
External	
Mode	2-68
Range Control.	2-19
Range Control Receptacle	2-68
Extreme Cold, Operating In	2-79
Extreme Heat, Operating In	2-82

F

Feed Assembly, Radar	
Inspection	3-89
Feed Chute	2-3
Feeder	2-3
Timing Pin	2-3
Filter, Sun	2-9
Firing.	2-58.1
Automatic Clearing	2-59
External Mode.	2-58.1, 2-68
Ground Mode (NORM).	2-58.1, 2-65
Ground Mode (STATIC).	2-58.1, 2-66
Interrupter.	2-8, 2-22
Interrupter Circuits Check	3-20
Manual Mode	2-58.1
Precautions When	2-56
Preparation For	2-39
Radar Mode	2-58.1
Rates	2-58.1
With Remote Arm Safe Switch	2-58.1

ALPHABETICAL INDEX – CONTINUED

F

	Page
Foot Switch	2-3
Fording Procedures	2-38
Forms and Records	3-2

G

General Procedures	
PMCS.	3-4
Ground Mode	
(NORM)	2-58.1, 2-65
(NORM & STATIC) Firing.	2-67
(STATIC)	2-58.1, 2-66
Check.	3-29
Gun	
Drive Motor	2-12
Emplacement	2-38.2
Shield.	2-3
Gunner's Quadrant M1A1	2-74
Gunner's Seat	2-8

H

Hangfire	2-56
Headset	
H-251/U	2-72
Heater, Battery	2-21
Hydraulic	
Preventative Maintenance Checks.	3-8
System	2-34
System Controls.	2-18

I

Index Marks Mount.	2-11
Index Symptom.	3-56

ALPHABETICAL INDEX — CONTINUED

I

	Page
Indicator	
Azimuth	2-32
RF Power	2-13
Inspection	
Antenna	3-89
Barrels	3-78
Breech Bolts	3-81
Center Clamp Assembly	3-77
Control Assembly	3-84
Declutching, Feeder	3-72
Distribution Box	3-72
Feed Assembly	3-89
General Procedures	3-4
M168 Cannon	3-75
Muzzle Clamp Assembly	3-77
Reflector	3-89
Installation	
Air Defense and Ground Role Muzzle Clamps	3-78
AN/TVS-2B/AN/TVS-5 Night Vision Sight	2-75
Instructions	
Maintenance	3-1
Operating	2-1
Prefire	2-40
Integral Components of End Items	B-2
Introduction	1-1

K

Kit Boresight	2-73
Knob, Caged	2-9

L

Lamps	
Azimuth Indicator	3-85
Control Panel	2-4
Receiver-Transmitter	2-14
RF Power	2-13

ALPHABETICAL INDEX — CONTINUED

L

	Page
Lamps - Replacement	
Azimuth Indicator	3-85
Control Assembly.	3-84
Ready-To-Fire-M61 Sight	3-85
Receiver-Transmitter	3-86
Reticle - M61 Sight	3-85
RF Power Indicator.	3-86
Lead Computing Sight	
Adjustments	3-33, 3-41
Description.	2-9
Linking-Delinking Operation	2-24
List	
Additional Authorization List.	E-1
Basic Issue Items List.	B-1
Expendable Supplies and Materials List	C-1
Components of End Item List.	B-1
Loading the Ammunition Storage Unit.	2-25
Location System Component	2-2
Log Book	
System	3-2
Low Voltage	
Indicator.	2-6
Preventive Maintenance Checks and Services	3-9
Protection Circuit.	2-58
Switch	2-6
Troubleshooting.	3-56
Lower Carriage	
Controls	2-17
Troubleshooting.	3-57
Lubrication	3-2
During Unusual Conditions	3-3
Service Intervals.	3-2

ALPHABETICAL INDEX – CONTINUED

M

	Page
M168 Cannon	
Automatic Clearing	2-59
Boresight.	3-30, 3-39
Breech Bolt Installation	3-82
Breech Bolt Removal	3-80
Center Barrel Clamp	3-75
Clamps	3-75
Cleaning	3-78
Inspection	3-75
Installation of Air Defense and Ground Role Muzzle.	3-78
Operator Clearing	2-57
Removal of Muzzle Clamps (Air Defense and Ground Mode)	3-78
Retor.	3-81
Stoppages	2-57
Timing Pin	2-3
M167A1 Controls, Instruments and Indicators	2-1
M1A1 Gunner's Quadrant	2-74
M61 Sight	2-9
Cleaning and Replacing Lamps	3-85
M134 Telescope	
Boresighting	3-33, 3-42
Description	2-10
Installation.	2-33
Telescope Mount, Description	2-10
Maintenance	
Auxiliary Equipment	4-1
Corrective	3-71
Forms and Records	3-2
General Procedures	3-4
Instructions	3-1
PMCS (Preventive Maintenance Checks and Services).	3-3
Procedures	3-71
Round Interval	3-55
Troubleshooting.	3-56
Manual Mode	
Check.	2-44
Firing.	2-63

ALPHABETICAL INDEX — CONTINUED

M	Page
Marksmanship	2-60
Midrange Calibration Check	2-55
Mode	
External	2-58.1, 2-68
Ground (NORM)	2-58.1, 2-65
Manual Firing	2-58.1, 2-63
Radar Firing	2-58.1, 2-61
Motors Azimuth Drive	2-12
Mount	2-4
Index Marks	2-11
M164 and Telescope M134	2-33
Muzzle Clamps	
Cleaning	3-77
Inspection	3-77
Installation.	3-78
Removal	3-75
Muzzle Velocity	
Dial	2-29
Dial Setting Chart.	2-29
N	
Night Vision Sight AN/TVS-2B	2-10
Installation.	2-75
Removal	2-75
Nomenclature	
Cross Reference	1-3
Operating	
Auxiliary and Support Equipment	2-71
In Dusty or Sandy Areas	2-83
In Extreme Cold (0° to -65°)	2-79
In Extreme Heat	2-82
Instructions	2-1
Linking-Delinking.	2-24
Under Normal Conditions	2-21
Under Rainy or Humid Conditions	2-84
Under Unusual Conditions.	2-79

ALPHABETICAL INDEX_ CONTINUED

P

	Page
Performance	1-2
Pin	
Cannon, Timing	2-3
Feeder, Timing	2-3
PMCS, See Preventative Maintenance Checks and Services.	
Power Supply	
Air Filter, Removal and Cleaning	3-88
Radar	2-2, 2-16
Precautions Clearing	3-5
Precautions when Firing	2-56
Prefire Instructions	2-40
Preparation	
For Firing	2-39
For Towing and Travel	2-35
Preventative Maintenance Checks and Services	3-3
Procedures	
Cleaning	3-4
Fording	2-38
Protective Covers	2-37
Publication References	A-1

R

Radar	
Antenna Unit 1	2-13
Boresight	3-30, 3-39
Check	3-25
Clutter Lock On Test	2-53
Components	2-13
Distribution Box (Stow Control)	2-16
Frequency - Changing	3-47
Initial Control Settings	2-47
Mid-range Calibration Check	2-55
Mode - Firing	2-61

ALPHABETICAL INDEX – CONTINUED

R

Radar - Continued	Page
Power Supply Air Filter	3-88
Power Supply Unit 5	2-16
Range Computer Unit 4	2-15
Receiver-Transmitter	2-14
Receiver-Unit 3	2-15
Turn-On	2-48
 Rainy or Humid Conditions, Operation In.	 2-84
 Range	
Radar.	1-2
 Range Computer	
Radar.	2-15
 Rates	
Firing.	1-2
 Ready-to-Fire Indicator	
Lamp Replacement.	3-85
Location	2-9
 Receiver-Transmitter, Radar Unit 2	
Air Filter Removal and Cleaning	3-87
Panel Lamps Replacement.	3-86
Power Lamp Replacement.	3-86
 Records and Forms.	3-2
 Reel and Handle - RL-39.	2-72
 Reflector	
Inspection	3-89
 Removal	
Air Defense and Ground Role Muzzle Clamps.	3-75
AM/TVS-2B/AN/TVS-5 Night Vision Sight	2-75
Barrels	3-75
Breech Bolt	3-80
Center Clamp	3-75

ALPHABETICAL INDEX—CONTINUED

R

	Page
Replacement - Lamps	
Azimuth Indicator	3-85
Control Assembly Lamps	3-84
M81 Ready-to-Fire	3-85
Receiver-Transmitter	3-86
RF Power	3-86
RF Power Indicator.	3-86
 RF Power Indicator.	 2-13
Rotor Assembly	
Cleaning	3-81
Inspection	3-81
 Round Interval	
Maintenance.	3-55
 Rounds Counter.	 2-8

S

Seat, Gunner's.	2-8
Security	
Inspection For.	3-4
 Service Panel on Carriage.	 2-2
Setting	
Air Density	2-28
Muzzle Velocity.	2-29
 Shield Gun.	 2-3
 Shoulder Harness and Seat Belt.	 2-8
Sight	
Current Generator	2-28
Current Generator Check	3-24
M81 Sight	2-9
Night Vision Sight AN/TVS-2B/AN/TVS-8	2-10
Traverse Lead Angle Check	3-21

ALPHABETICAL INDEX – CONTINUED

S

	Page
Sight and Fire Control	
Troubleshooting.	3-64
Storage Unit	
Unloading the Ammunition	2-27
Starting Engine	
APU	2-76.1
Stoppages	2-57
Stow	
Control Unit 6.	2-3
Controls	2-16
Sun Filter M61 Sight	2-9
Super-Elevation Check	
Manual and External Mode	3-22
Supply List	
Expendable and Material.	C-1
Suspension System	
Preventative Maintenance Checks and Services	3-7
Switches	
Action	2-6
Brake-Clear and Brake	2-3
External Range Control	2-19
Firing Rate.	2-4
Gun Clear	2-4
Gun Power.	2-4
Interlock, Receiver-Transmitter.	2-14
Low Voltage.	2-6, 3-9
Midrange Calibration	2-16
Mode	2-5
Norm-Static-Test	2-6.1
Off-Run, APU Engine	2-20
Overload Reset, Receiver-Transmitter	2-14
Sight Cage	2-5
Stow Control	2-16
System Power	2-4
Trigger	2-5

ALPHABETICAL INDEX – CONTINUED

S

Page

Symptom Index 3-56

System

Component Location 2-2, 2-3
 Controls Hydraulic 2-18
 Distribution Box 2-6.1
 Hydraulic 2-18
 Logbook 3-2
 Power Check 3-19

Systematic Preventative Maintenance 3-1

T

Tabulated Data 1-1

Target Alert Data Display Set 2-70.1

Target

Method, Boreighting 3-39
 Practice Ammo 5-3
 Telephone set - TA-312PT 2-72

Telescope

M134 2-10, 2-33

Test

Clutter Lockon 2-53

Timing Pins

Cannon 2-3
 Feeder 2-3

Tire Pressure 1-2

Tools and Equipment 3-2

Towing and Travel

Preparation For 2-35

Travel Lock 2-35

Troubleshooting 3-56

Cannon 3-60
 Lower Carriage 3-57
 Sight and Fire Control 3-64
 Upper Mount 3-58

ALPHABETICAL INDEX – CONTINUED

U

Page

Units

1 - Radar Antenna	2-13
5 - Radar Power Supply	2-16
4 - Radar Range Computer.	2-15
3 - Radar Receiver	2-15
2 - Radar Receiver-Transmitter	2-14
6 - Stow Control	2-16

■ Unloading the Ammunition Storage Unit	2-26.2
---	--------

Unstowing Antenna.	2-49
----------------------------	------

Unusual Conditions

Lubrication During	3-3
Operation Under	2-79

Upper Mount

Troubleshooting.	3-58
--------------------------	------

W

Wear

Inspection For.	3-4
-------------------------	-----

Weights and Dimensions	1-1
----------------------------------	-----

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DEPARTMENT OF THE ARMY
Washington, DC, 28 May 1976

TM 9-1005-286-10, is published for the use of all concerned.

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To be distributed in accordance with DA Form 12-40 (qty rqr block No. 168)
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M167.

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3

2

Item 10. Change illustration. Reason: Tube end shown assembled on wrong side of lever cam.

109

51

Item 3. The NSN and P/N are not listed on the AMDF nor the MCRL. Request correct NSN and P/N be furnished.

2-8

2-1

Preventive Maintenance Checks and Services. Item 7 under "Items to be inspected" should be changed to read as follows: Firing linkage and firing mechanism pawl.

12

1-6a

Since there are both 20- and 30- round magazines for this rifle, data on both should be listed.

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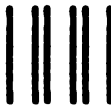
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